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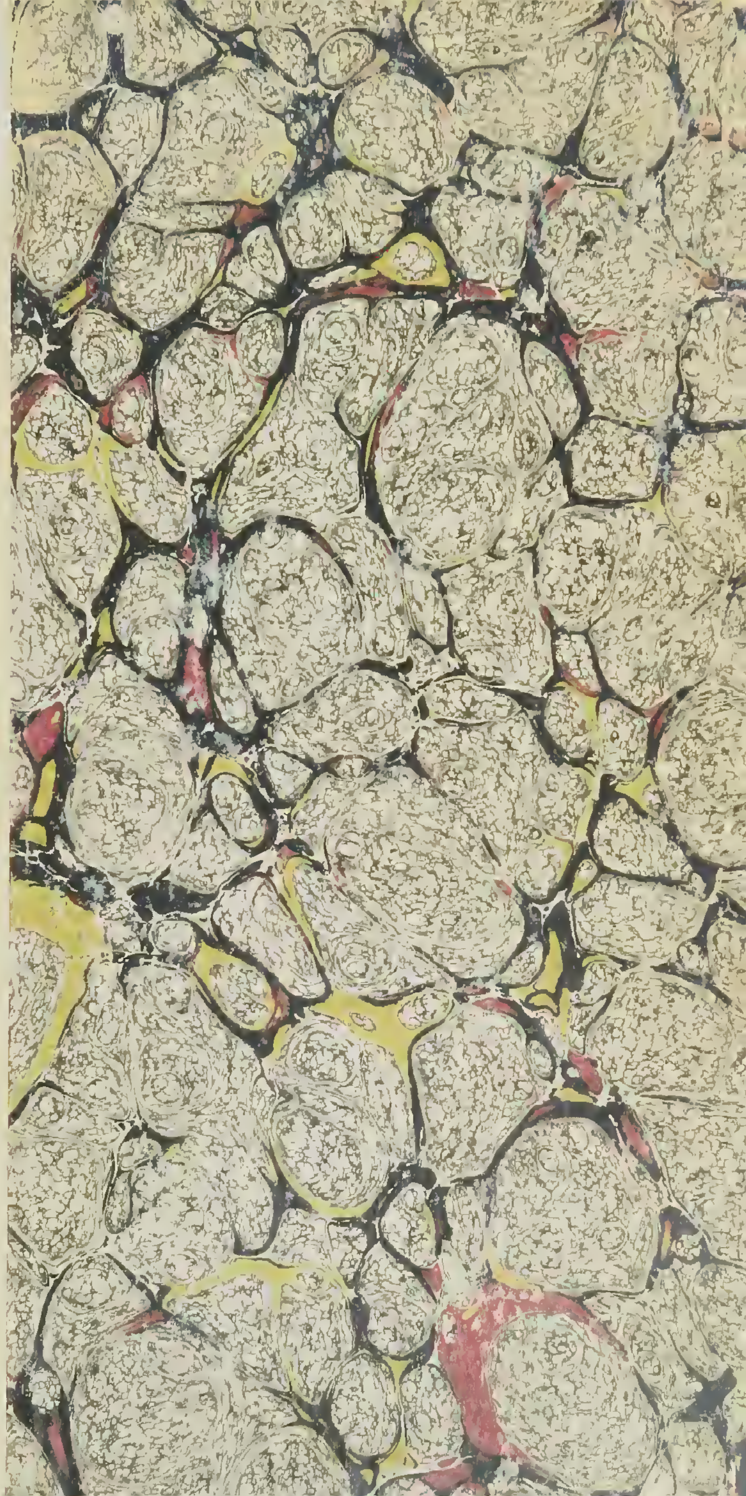

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New Developments in Poultry-Raising

(ILLUSTRATED)

BY

HELEN STRATHMORE,

Authoress of 'Poultry Emancipated.'

IN TWO PARTS.

PART I.

Lampless Chicken-Brooders

Demonstrating the Efficiency of a New, Simple, and Inexpensive
Method of Chicken-Rearing under Artificial Conditions,
including a chapter on Cold Brooders,
their Construction, Use, and
Management.

◆

PART II.

The Economic Production and Preparation of Home-Raised Poultry-Feeding Stuffs.

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New Developments in Poultry-Raising.

PREFACE.

THIS little treatise is submitted to the consideration of the poultry world with the twofold object of: (a) introducing a more efficient and less expensive method of brooding and rearing incubator-hatched chickens, ducklings, &c., than the various systems generally practised; and (b) showing the economic advantages attending the utilization of the soil for the production of poultry feeding-stuffs at first cost, and the manner of their treatment by artificial means for increasing and improving their feeding properties.

Readers already acquainted with '**Poultry Emancipated**' will readily understand that there is nothing theoretical about the teachings set forth in these pages, and that we would never advocate the employment of methods which had not successfully stood the tests of everyday practice.

It would be ungracious on our part did we omit to seize this opportunity of tendering our warmest thanks to the Press and the public—the agricultural and utilitarian section of the Poultry Press in particular—for their unstinted commendation of our past efforts in forwarding the cause of what is destined to become one of the most important staple industries of rural Britain.

With these few preliminary remarks we surrender the fruits of our labour to the use of poultrydom, and venture to hope that the information conveyed may be of real value to all interested in the economics of poultry culture, whether for profit or for pleasure.

HELEN STRATHMORE.

August 3rd, 1908.

PART I.

Lampless Chicken-Brooders,

INCLUDING

A Complete System of Cold Brooding.

THE total annual monetary loss sustained by British poultry raisers owing to defective methods of housing and rearing must be appalling. Indeed, the fact that the publishers of this booklet received applications for upwards of 3,000 copies within five weeks of the announcement of its advent confirms the truth of our estimate, and indicates the measure of interest shared by poultry keepers of all degrees in this particular subject.

In our novitiate days—in poultrydom—it was our custom to rely solely upon the maternal hen for hatching and rearing the broods of chicken required for home use. The birds being bred for utility purposes only, and their prolificacy as layers having been noised far and wide, we were soon induced to combine business with pleasure, a step which necessitated the use of considerable numbers of broody hens throughout the early months of the year.

In those days there were but some three or four different makes of artificial brooders in the market, and so far as efficiency was concerned there was little to choose between one or the other of them. Even unto this day the designers still continue to set at naught the very first principles of hygiene, with the result that all who make use of such appliances inevitably have to pay the penalty for deviating from Nature's laws. We have tested the merits of every improvement which the makers claim to have embodied in their inventions, but beyond some trifling differences in external appearance, and a few minor constructional details, very little advance has been made towards solving the problem of cheapening the methods of rearing poultry under artificial conditions.

The Work of the Maternal Hen and Artificial Brooders compared.

WE have only to compare the conditions and surroundings of chickens reared naturally with those reared by artificial methods, when the conditions so essential to success are at once seen to be materially lacking in the appliances so much in vogue.

The accompanying tabulated particulars are based upon data collected when conducting experimental work in connexion with the brooding and rearing of newly-hatched chickens, and the figures given show at a glance the disparities in temperature which occur under the different conditions of rearing.

Comparative Temperatures of the Maternal Hen and Artificial Brooders.

Date.	Outdoor temp.		Temp. inside Coops. Thermometer bulb attached under Hens' wings.		Temp. inside Artificial Brooder.		Chicks alive.	
	Max.	Min.	Max.	Min.	Max.	Min.	With Hens.	In Brooder.
Feb. 10th ...	49°	37°	78°	76°	91°	88°	43	58
,, 17th ...	48°	38°	74°	70°	89°	80°	42	47
,, 24th ...	38°	34°	69°	66°	84°	82°	42	41
March 3rd ...	44°	33°	71°	65°	89°	79°	42	37
Number of birds alive at the end of three weeks ...							42	37
Number of deaths during same period							1	21

The particulars, it will be observed, cover a period of three weeks, and represent the work accomplished by four hens in charge of their own broods amounting in the aggregate to 43 chicks at the start ; and, a 100-chick capacity foster-mother of a well-known make, in which were put 58 strong, incubator-hatched birds of the same breed as those with the hens. The brooder was placed in a sheltered position on a plot of arable land, and the hens and their broods were cooped in an open shed facing west ; all the chicks were dieted and treated alike, except that those with the hens enjoyed more liberty in the open from the third day after birth. The thermometers were, with some little difficulty, attached under the hens' wings, and the readings in all cases were taken between one and two o'clock in the morning, and again at mid-day. The fact that the temperature of hen and chickens was highest during perhaps the coldest period of the whole 24 hours, would, no doubt, be due to the mothers having brooded their families closely for several hours together without disturbance.

In the case of the foster-mother the lowest temperatures occurred at mid-day, (a circumstance probably contrary to what many people might expect) the difference between maximum and minimum representing, we presume, the amount of animal heat of the birds when in or outdoors as the case might be ; some portion of this loss of heat inside the brooder would, however, be accounted for by reason of the extra amount of ventilation allowed in the temporary absence of the inmates during the daytime.

The foster-mother was of the hot water tank type with lamp in an outer compartment, and was managed by a skilled operator of several years' experience. The total consumption of oil for the period named amounted to 18 pints, at a total cost of 1s. 5d., purchased in bulk. The chicks had been sold in advance for delivery when eight weeks old at the rate of 22s. 6d. per doz., so that, valuing them at 8d. apiece only as day-old chicks, the monetary loss sustained on account of deaths amounted to no less than 14s., to say nothing of such items as labour, oil, food, and wear and tear of the appliance.

It is true that the percentage of losses under artificial conditions is not quite so high later on in the season; not because the temperature of the brooder is then more equable or controllable, but for the very good reason that the inmates are able to pass the greater part of the day in the open, thus escaping from the evil effects of the vitiated air and almost tropical heat of the dormitory. And, although we may succeed occasionally in dragging (it cannot be called 'rearing') 70, or even 75 per cent. of chicks through the ordeal, yet are these occasions more the exception than the rule, and the survivors are more or less weakened in constitution. Indeed, a comparison of the temperatures prevailing under natural and artificial conditions of chicken rearing plainly demonstrates the impossibility of imitating and maintaining the animal heat of the maternal hen when lamp heat is employed for the purpose.

Fatal Defects common to Chicken-Brooders.

The principal defects common to most chicken-rearing appliances are:—(1) Overcrowding, due to an appalling insufficiency of floor area and cubic air space; (2) excessively high and fluctuating temperature of the dormitory, partly owing to lack of control over the source of heat supply; and (3) insufficient ventilation.

Overcrowding.—Here is a wooden box with, say, a total floor area—*including the outer chamber*—not exceeding 18 square feet (and this is more than is allowed in some cases), in which the manufacturer blandly invites us to herd together 100 or more newly-hatched chickens. Just think of what the struggle for existence must be among so many hapless little creatures thrust into such a death-trap!

The people who guarantee these lethal appliances to rear '100 per cent.' of birds may know how to construct and show off to perfection an apparatus that will keep alive a number of chickens for two or three days at an exhibition; but the same contrivance when put to everyday use very soon reveals the fact that things are not exactly what they seem.

Overcrowding, with all its concomitant evils, needs only to be seen to be condemned; the weak battling with the strong—the fetid atmosphere—insufficiency of sleep—waste of food, much of which is unavoidably rendered foul and dangerous to the health of such delicate creatures as chickens but a few days old; these are the evils with which the poultryman has to contend when struggling to preserve the lives of the weaklings which have cost him time, money, and no little anxiety to produce.

Who ever knew of a hen to succeed in rearing a brood exceeding 16 or 18 in number at the outside? However, the absurdity of the practice of crowding together large colonies of newly-hatched chicks in one and the same chamber is patent enough to all who are not wilfully blind, and the subject is really not worth pursuing any further.

Temperature of the Brooder.—We now come to the methods commonly employed for heating artificial brooders. These consist of ; a petroleum lamp placed in the centre of the dormitory, the heat of which is diffused by (a) an overhead single sheet metal radiator ; (b) a ventilated hot-air tank ; (c) or an overhead water-tank connected with a lamp and flues situated in an adjoining chamber.

The defects in every case are practically the same, and may be summed up as follows : The products of combustion (carbonic acid and other noxious gases) thrown off by the lamp, destroy the very limited amount of pure oxygen which finds its way into the dormitory, and these gases are sometimes so great in volume that no amount of ventilation short of direct draughts of air will suffice to drive them out. An abundance of pure, fresh air is, of course, essential to the very existence of chicken life (or any other form of life for the matter of that), and yet the available amount of cubic air space in the average type of brooder is much too limited to allow of anything but an atmosphere reeking with life-destroying gases.

The makers who adopt the hot-water tank system claim an advantage over the hot-air system with its lamp and simple radiator only. But this advantage is more apparent than real, and is more than counterbalanced by the excessive heat diffused by a fairly large volume of water constantly at boiling point, and the inability of the operator to reduce or control it according to the atmospheric changes without.

'But why not lower the temperature of the tank by adopting the simple expedient of reducing the size of the lamp flame?' For the very good reason that, unless the flame be always kept fairly high, it will throw off gaseous vapours in increased quantities, if not actual smoky fumes ; and this is the price to be paid whenever we attempt to reduce the heat of the water-tank. Consequently, unless the flame be maintained almost at its full height during the night time, the danger of the lamp smoking—with the possibility of a disastrous fire—is very great indeed ; so that in seeking to minimize one danger, there is no alternative but to bear the consequences of another, for in the morning the water in the tank is generally found to be on the boil, and the chickens sweltering in a temperature equal to, or even higher than, that required for the process of incubation.

The after-effects on the health of the birds may be well imagined. They are loth to leave the stupefying heat of the dormitory for the breakfast which awaits them in the outer run ; their appetites are more or less blunted ; and at every breath of cold air they gasp, shiver, and probably contract a cold, with the result that inflammation of the lungs will often supervene, when those afflicted gradually sink and die under the feet of the more fortunate survivors.

Moreover, chickens raised under such unnatural conditions are particularly liable to attacks of diarrhœa. In its simple form the cure is comparatively easy ; but inflammatory diarrhœa is of a more serious nature, and this often follows when the birds are cabined and confined in an atmosphere charged with the foul gases produced by animal excretions, to say nothing of the danger of a portion of this excremental matter being consumed along with the particles of food which are often carried into the dormitory. Dysenteric diarrhœa also is not a trouble altogether unknown among chickens so raised, and when this makes its appearance death claims its victims on a wholesale scale.

Of the different methods of heating in common use we certainly prefer that of the lamp and simple form of radiator. It is safer, more economical, and, what is of still greater importance, a more equable temperature can be maintained, since the radiator can be removed and cooled at the will of the operator.

On the other hand, there always remains the possibility of overheating—especially during severe frosts—with its attendant danger of 'firing.' The noxious products of combustion created by the lamp are also inseparable from the system, because the amount of ventilation necessary to redress the evil cannot possibly be permitted without subjecting the inmates to a constant current of cold, and sometimes damp, air ; and the flame of a petroleum lamp being very sensitive to little gusts or waves of air, it is always liable to flare up or be extinguished in a faultily constructed appliance.

Again, when lamps are employed for heating—whether in conjunction with water-tanks or not—the air is, in reality, *baked;* and when baked air remains for several hours together at a high temperature, laden with the gases which rise from the animal excrements on the floor, then we may safely conclude that such conditions cannot possibly be conducive to the good health of any living creature.

Perhaps the most disturbing factor to be reckoned with in the use of these 'scientific' appliances is that they are capable of developing a temperature as high as 55—or even 60—degrees above that of the external atmosphere. Unlike the horticulturist, however, who has perfect control over the heating and cooling of his forcing-houses, the operator of the chicken foster-mother is unable to respond to the changing requirements of his charges without incurring the risks already mentioned.

What a striking contrast is all this to the methods of the maternal hen in the brooding of her offspring ! Nature herself prompts the mother as to *when* and *how* to regulate the temperature necessary to the comfort and health of her brood ; for so soon as she may feel uncomfortably warm herself, she will raise her body off the little ones and alter her position according to the necessities of the moment, just in the same manner as she moves and airs the eggs entrusted to her care during the process of incubation. Then, when any of her family feel excessively warm or inconvenienced, they instinctively force their way to the side of the nest, whilst others less warm retire into the vacated places. And so all through the night this natural system of warming and cooling goes on ; a process impossible when large numbers of birds are boxed up in an appliance wherein the same high temperature is inexorably maintained for hours together, with never a loophole of escape from the 'scientific' stupidity of the authors of their misfortunes.

Theory v. Practice.

APPARENTLY, manufacturers are imbued with the idea that the temperature of an artificial brooder should be equivalent to the blood heat of a fowl. But, they ignore such all-important considerations as: The difference in the amount of heat necessary for *incubation* and *brooding* respectively; that chickens, like all other birds and animals, evolve a considerable amount of natural heat, which is increased or diminished according to their number and the amount of cubic air space allotted them; and, in the case of a hen and chickens, the natural moisture of their bodies and of the immediate surroundings of the nest mingles with, and tempers the air inhaled by the birds; whereas the air of the dormitory of a foster-mother is baked to a perfectly dry state and partially consumed by the lamp flame. So that, under artificial conditions, there is the animal heat evolved perhaps by as many as 50, 80, or even 100 birds to add to the dry heat of the foster-mother, *minus* the natural moisture of the hen mother.

The blood heat of the feathered race is about 107 degrees Fahr., and a reference to the record of comparative temperatures will show that the maximum heat contributed by both hen and chickens was only 78 degrees a few hours after hatching, *or 29 degrees below the blood heat of the mother.* Thus do we see how very erroneous may be the conclusions arrived at by those who act upon theory only, since theory does not always reveal the real truth in matters of this kind.

Experience, then, gradually tended to confirm some preconceived ideas of ours concerning the whole subject, and eventually proved to our satisfaction that *the animal heat of the maternal hen is no criterion of the degree of temperature essential to success in the brooding and rearing of chickens direct from the shell, under artificial conditions.*

Improper Ventilation.—The subject of ventilation is so closely interwoven with the points already noticed that no useful purpose would be served by discussing it separately.

There is yet another system of rearing, or attempting to rear, chickens under artificial conditions. It consists of a room fitted up with a lamp, boiler, and a miniature set of hot-water pipes, under which the birds retire for warmth. But, apart from the possession of a liberal stock of patience and an abundance of spare time for executing repairs, it is necessary to have served an apprenticeship with a plumber or a tinsmith before venturing upon chicken-raising under the conditions named.

Necessity the Mother of Invention.

OUR incubator plant being called upon to turn out between ten and fifteen thousand head of poultry every season, impelled us to redouble our efforts towards perfecting some system of rearing which would combine efficiency with economy. About 60 per cent. of the output would be ordered and sold in advance as day-old chickens, and the remainder had to be accommodated and reared in such appliances as could be requisitioned for the purpose. It may be readily imagined how difficult it was at times to provide the necessary accommodation for so large a number of birds; and many were the hastily-conceived devices and makeshifts which the manager and his assistants were wont to make use of in an emergency. In all this, however, lay golden opportunities for solving, *inter alia*, the very problem now before us; and a reference to some memoranda of operations for the period named discloses the interesting fact that many hundreds of incubator-hatched chickens passed their early days under the following conditions:—

(1) December-January. On the earthen floor of a vinery, where the vines were being started into growth with a temperature as low as 45 degrees by night, but rising to about 60 degrees in the daytime. The floor of the vinery was bedded with a mixture of dry leaves, hay seeds, and sand; the 'brooders' consisted of inverted packing-cases, ventilated, and lined with soft, damp-proof paper pads. Apart from the gentle fire heat supplied by a double row of flues, the only agency employed for warming the brooders consisted of an ordinary paraffin-oil bottle filled with hot water at 8 p.m. daily, until the chicks had attained the age of 10 or 12 days. Weather permitting, the boxes and inmates were taken outdoors for several hours during the daytime, and placed in small wired-in enclosures on the south side of stone walls, wooden fences, &c., where the chicks were fed and allowed to run about in colonies of 15 and 16 birds. The boxes (brooders) were stood on thick layers of dried tree leaves, bracken, and other loose litter, the ground having been under cultivation for some months previously; pieces of tarpaulin lined with thick canvas were thrown over the boxes, and the only artificial heat supplied consisted of the hot-water bottle arrangement already mentioned.

(2) January-February. On the brick floor of a building containing between 30 and 40 incubators; floor covered with sand to a depth of 3 or 4 inches. Many of the brooders consisted of contrivances similar to those used in case No. 1; while others were fashioned out of fruit baskets, lined with damp-proof paper and fitted with loose canvas covers for use during the night-time. Temperature of building: maximum, 66 degrees; minimum, 60 degrees. These readings, however, do not indicate the temperature at the floor level, where it generally ruled from 5 to 7 degrees lower. The hot-water business was dispensed with in this case as soon as the chickens were eight or ten days old, when the bottles (sheathed with thick felt) were half filled with sand and left under the boxes or baskets for the birds to nestle against, the sand, of course, merely being used for weighting the bottles, so that they might not be displaced by the pressure of the chicks.

(3) February-March. On the earthen floor of a cool greenhouse, 40 feet long by 15 feet wide. Inside temperature often as low as 40 degrees. Same sort of brooder makeshifts were utilized as in case No. 1; but the tin bottle warmers were replenished with hot water every four hours between 7 a.m. and 9 p.m., and during the night four stable lamps of the hurricane type were left burning on the floor at intervals of 10 feet apart down the centre of the house. The temperatures recorded inside the brooder-boxes averaged: maximum, 63 degrees; minimum, 59 degrees; and the readings of the thermometers were taken after the chicks (12 to 16 in each box) had been resting indoors for some time.

Again, we have forwarded consignments of newly-hatched birds to Scotland, Wales, and Ireland during the coldest months of the year, and the losses (deaths) in transit have never in any year exceeded 6 per cent. They were packed in the usual manner, in shallow ventilated boxes (occasionally in baskets) lined with wood-wool and felt. Indeed, we have known consignments to have been delayed at a railway station from Saturday till Monday, and yet they all survived the experience, notwithstanding the bitterly cold weather prevailing at the time.

Bearing the foregoing facts in mind, and after duly considering the purpose and construction of the component parts of the Lampless Chicken Brooder, readers may then draw their own conclusions with regard to the efficiency, economy, and rationalness (or otherwise) of our system of rearing chickens under artificial conditions.

THE LAMPLESS BROODER.

FIG. 1.

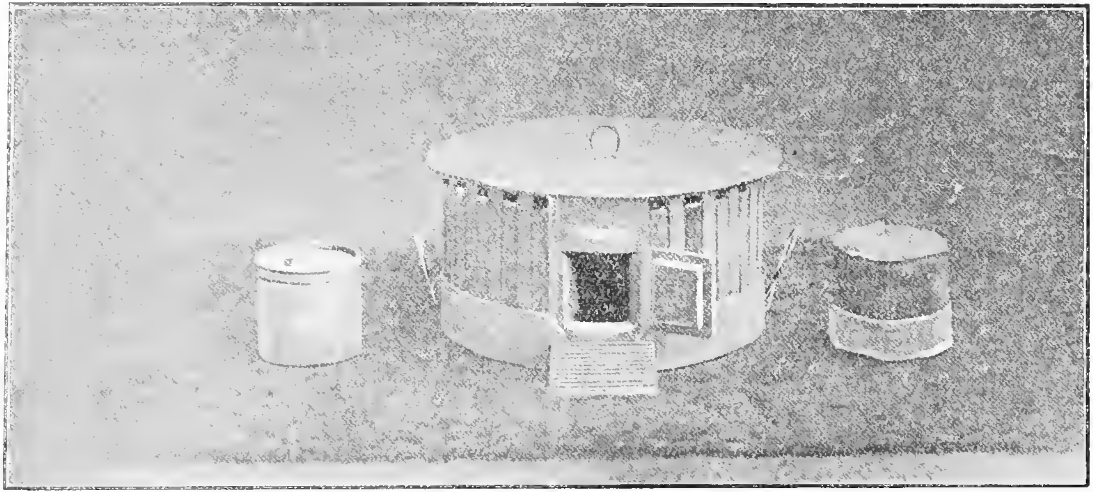

Photo-Illustration, hereinafter referred to as Fig. 1. Showing Brooder as in practice; with Hot-Water Container on the left, and Cosy Cover of the Water-Container on the right.

THE LAMPLESS BROODER.

FIG. 2.

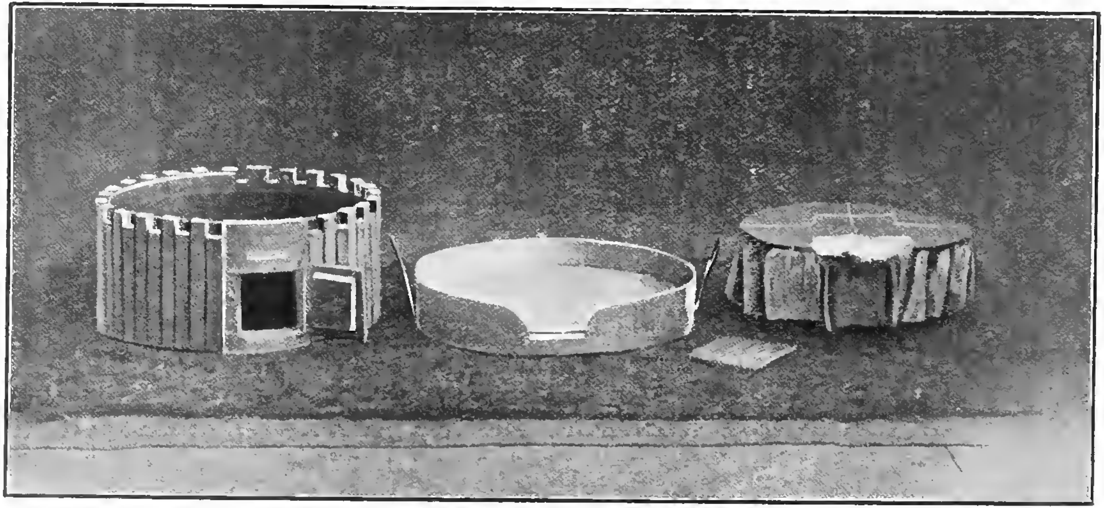

Photo-Illustration, hereinafter referred to as Fig. 2. Showing component parts as follows:—On the left, Carcass or Body; in the centre, loose Floor-Stand; on the right, movable 'Hover,' which rests on the Hot-Water Container. The small object lying flat in the foreground is the Chicken Ladder. *The outer or principal Cover of the Brooder is seen in position in Fig.* 1.

New Developments in Poultry-Raising.

THE LAMPLESS BROODER IN PRACTICE.

THE secret of the success of our system lies, as the reader will soon perceive, in its very primitiveness; and precisely because of the primitiveness of our methods many people will, we fear, shake their heads in doubt, and elect to continue the chicken-rearing game under the tuition of those whose business it is to make it as costly as brains and ingenuity—'scientific' ingenuity—can devise.

Fixed ideas and old-time methods are bad to kill, as we all know; still, only those whose minds are warped by stubbornness and prejudice would, we imagine, reject any practical system which promises both efficiency and economy merely because its moving principle happened to be based upon a primitive idea.

The illustrations (Figs. 1 and 2) practically explain the simple means whereby this efficiency and economy are attained.

Briefly, the apparatus consists of nothing more nor less than a low circular-shaped box, made of straight wooden staves, lined internally with non-conducting materials, and warmed by means of a movable metal vessel containing hot water, the heating power of which is sufficiently maintained for several hours together by the use of a hair-felt cover. The inmates are screened from direct currents of air by a hover, which consists of an overhead disc made of non-conducting materials, from which is suspended a curtain of soft netting; the hover is seen on the right in Fig. 2.

In Fig. 1 is shown the original indoor Lampless Brooder made some five years ago. It is the first of its kind ever introduced to the notice of the public, and represents in all essential details the one type of chicken foster-mother adopted by us for regular use. We have purposely selected the original model for our present purpose as an evidence of the complete efficiency and success of the apparatus in everyday use. That it will satisfactorily perform the 'brooding' part played by the maternal hen is amply proved by the fact that during the five seasons it has been in use (from December to May in each year inclusive) no fewer than 498 incubator-hatched birds have successfully passed the first stage of their chickenhood in it, out of a total of 525 entrusted to its care; so that the number of fatalities (all due to natural causes) did not quite equal 6 per cent. during the period mentioned.

Specification and Construction.

The component parts, quantities, and method of construction are as follows:—

(1) **The Carcass or Body.**—Is composed of staves made of sound red deal, bound together on the inside with two strips of galvanized sheet iron; each alternate stave is 1 inch shorter than the other (except at the chicken-exit), the upper edge of the body thus having a battlemented appearance. On the inside a narrow strip of perforated zinc runs right round, sufficiently wide to cover

the 1 inch square embrasure-like openings as seen in Fig. 1, thus providing for a complete system of top ventilation. The remaining portion of the inner side of the carcass, i.e., the entire surface space represented by the shorter staves, is lined with thick hair-felt enveloped in damp-proof brown paper.

Extreme diameter, 19½ inches; extreme height, 9 inches. All the staves are of the same thickness, 1 inch by ¾ inch; and the quantities are: 28 pieces, each 9 inches long; 27 pieces, each 8 inches long; for the top of the chicken-exit, four pieces, each 3½ inches long; and for the bottom (or tread) of exit, four pieces, each 1 inch long; the size of the door or exit is thus 4½ inches high by about 4 inches wide; and the thickness of the body wall is ¾ inch all round, or just a trifle over 1 inch when the lining is in position. The timber used should be rendered *perfectly dry* (this is of importance) before it is cut up and planed, and the edges of the staves ought to be as uniformly straight as possible. Next are required: one strip of perforated sheet zinc, 60 inches long by 1¼ inches wide; and two strips of galvanized sheet iron, each 60 inches long by 1 inch wide; some ½-inch tacks; some ⅝-inch round wire nails with flat heads; and one length of hair-felt (not less than ¼ inch thick), 60 inches long by 7½ inches wide; and one length of damp-proof brown paper, 60 inches long by 18 inches wide.

Arrange all the staves closely together in a row—either on a bench or the floor—observing that the different lengths (8-inch and 9-inch) appear alternately (see Fig. 1), and that the ends are all on a level at the bottom. It should be explained that the four short staves immediately above the exit being all of the same length (3½ inches), there are consequently no ventilation openings at this point. To prevent the staves being displaced while binding them together, a thin lath may be temporarily nailed across the centre of the staves, say a nail at each end and one midway between the two. Now take the piece of perforated zinc and tack it all round over the ventilation openings, so that the upper edge of the zinc is almost on a level with the tops of the longer staves. The strips of sheet iron are next fixed firmly and neatly to the staves, one at the bottom and the other at the top, so that the upper edge is flush with the tops of the shorter (8-inch) staves and just overlaps the lower edge of the zinc band. The wire nails being easily bent, it is advisable to first punch a tiny hole in the metal bands at the centre of each stave, when the nails will penetrate without bending.

The whole of the staves having been made secure to the metal bands, the holding lath may be removed, and the carcass is ready for bending to the required circular shape; the bands being some 2 or 3 inches greater in circumference than the carcass, there remains plenty of margin for overlapping and securing the two ends when brought together. The woodwork may now be treated with a preservative solution of some sort (we never use paint for these brooders), or what is equally as good for the purpose, the whole may be saturated (inside and out, including tops and bottoms of the staves) with a solution composed of four parts of gas-tar to two parts each of paraffin and turpentine. First heat the tar, strain through a paint-strainer, mix thoroughly with the other ingredients, and apply freely with a brush, or the carcass may be immersed in a bath of the solution; then hang up and leave to dry in the open before proceeding further with the work. In any case, chickens must not be put in a new brooder until all trace of the smell of the tar (or other solution) has disappeared. When the carcass is perfectly dry—not before—it is ready for lining. Simply fold the paper down the centre, place the felt between, turn over the edge, and fix round the inside with tacks (a tack in every fourth stave sufficient), so that the top edge of the lining reaches just below the ventilation openings. The felt should be thick (¼ inch at least), and the paper we use is that made by the Willesden Manufacturing Company.

The door is made of galvanized sheet metal, although block tin would probably make a satisfactory substitute if rendered rust-proof by coating with black varnish. The exact size when in position is 5 inches by 4½ inches, but if a hinged door is required the material must be cut a good inch longer. The hinges (we are speaking of a home-made article) simply consist of two stout pieces of plain fencing wire, inserted in grooves across the top and bottom of the door. Cut the wires into 5½-inch lengths, twist one end of each into an eyelet, and bend the top and bottom edges of door so that they grip the wires tightly. The door swings on two tenter-hooks inserted in the first stave on the right-hand side of the doorway. No doubt other and more simple methods of fastening will occur to those unequal to the task of making a swing or hinged door. The inner side of the door is thickly padded with hair-felt. The size of the pad is 3 inches by 2½ inches by 1 inch thick, thus leaving a marginal space of 1 inch on all four sides; the felt is stitched to the door with a thin strand of copper wire (or twine) drawn through a couple of holes pierced in the centre of the door. The position of the felt pad is plainly visible in Fig. 1; indeed, the photograph explains the whole thing much better than any amount of descriptive writing can do. Bottom ventilation is provided by making perforations in the marginal space on the lower half of the door, i.e., immediately below the bottom of, and half way up on either side of, the felt pad.

The Floor-Stand.—The floor of the brooder is detachable, and consists of a wooden bottom with a metal surround or skirting extending 2 inches above the floor level, within which the body of the brooder should fit easily yet not loosely.

Diameter of bottom, 20 inches (*not less*) by ¾ inch thick; the boards to be tongued and grooved, and the beaded side (if the boards are beaded) to face the ground, so that the upper side or floor surface shall be as free from joints as possible. The two cross-pieces for holding the bottom together are, of course, nailed on the under side, and they should be 1 inch square, thus raising the surface of the floor 1¾ inches above the ground level. After nailing together, treat both sides with two applications of tar solution; the mixture should be fairly hot, and sufficient time must be allowed for drying between the first and second applications.

For the skirting, a strip of galvanized sheet iron, 64 inches long by 3½ inches wide, is required. Stand the wooden disc on an even surface, and fix the skirting to the edge with 1 inch wire nails. At the point where the two ends of the metal skirting meet an opening 5 inches wide is left, this being the point of access to the chicken-exit when the body of the brooder is placed in position on the floor-stand. To make this opening it is necessary to cut away a 5-inch strip of the skirting above the floor level; the corners are then rounded off as seen in the illustration, thus giving the skirting the appearance of a stand-up shirt collar with rounded points. If tin is used instead of iron, it should be varnished to prevent rusting; the galvanized sheet metal is much to be preferred. and most iron-mongers (or blacksmiths) would cut a strip to size at the cost of a few pence. Lifting-handles may be made of thick, plain fencing wire, bent to the required shape, and then fixed on the under side of the woodwork; two V-shaped notches are made in the lower edge of the skirting for the wires to pass under, and the ends are then clinched to the bottom with wire nails or small staples.

The Outer Cover.—For indoor use the principal or outer cover may, if preferred, consist of felt and damp-proof brown paper; such a cover is light, easily constructed, and admirably serves the purpose for which it is intended. The method of its construction is as follows:—Diameter, 22 inches. Requires: two pieces of thick ($\frac{1}{4}$-inch at least) hair-felt, each 22 inches square; two pieces of damp-proof brown paper, and one piece ordinary thick, glazed brown paper, all same size as the felt. Draw a circle 22 inches diameter on one of the pieces of paper, and cut to shape with a pair of scissors; the other pieces of paper and felt are then cut from the pattern disc already made. Place the common paper disc *between the two felt ones,* and fasten together with a little 'Seccotine' or glue, a drop here and there near the outer edges being sufficient for the purpose; press firmly together and allow to set hard before handling again. This felt disc is then placed between the two damp-proof paper ones, and made fast all round the edge with some kind of strong adhesive. Next, fashion a light handle out of a piece of stout wire, nip the two ends together as one piece, push them through the centre of the cover, and bend the ends in opposite directions on the under side. To prevent the handle enlarging the hole in cover it is advisable to face both sides with small metal discs, through which the ends of the handle should pass when fixing in position. For outdoor use the principal cover is made of more substantial materials, and, under certain conditions, the brooder is also provided with a waterproof body protector, a matter which shall receive attention presently.

The 'Hover,' or Inner Cover.—The hover (seen on the right in Fig. 2) is intended for the conservation of the heat supplied by the vessel of hot water, and for the protection of the chicks from direct currents of cold air which may enter the brooder at the points of ventilation. With the exception of the curtain and the wires necessary for its support, the same kind of materials and method of construction are employed as those described when dealing with the outer cover. The curtain is of soft, cellular-like material, similar to the heavier kinds of green shading used for making greenhouse blinds; of course, some other kind of material may be used, provided that it is sufficiently porous or open, without being too flimsy. Diameter of top, 16 inches; depth of curtain, 6 inches. The length of the curtain material should be 15 inches or so greater than the circumference of the cover, say, 60 inches long, and

7 inches wide, thus allowing for a little fullness, and a hem at the top. It is fastened with waxed carpet thread to a light wire rod running round immediately under the edge of the cover ; the rod—which should be fastened in position before the curtain is attached—is supported by two stout pieces of wire fixed cross-wise on the top of the hover, and the ends of the wires are bent so as to form loops or eyelets (similar to the top of an ordinary steel meat skewer), through which the curtain rod passes. *The hover, as described, is the same whether the brooder is intended for indoor or outdoor use.*

The Hot-Water Container.—The type of heating vessel which we have used with such success is seen on the left in Fig. 1. Extreme height, 6 inches ; diameter, 6 inches. It is made of a stout gauge of galvanized sheet iron, with a sunk top ¾ inch deep, and is provided with a brass nozzle and screw cap, and a fall-down wire handle. An ordinary tin paraffin-oil bottle (½-gallon size) makes a fairly good substitute, although the use of such bottles really necessitates a greater initial outlay, owing to the fact that they average some 9¾ inches in height, and this means a corresponding increase in the height of the brooder. Moreover, not being air-tight, the duration of their heating power is curtailed, and the condensation of the steam which escapes—be it ever so little—eventually lowers the temperature within the hover. All points considered, then, the special type of water-container should certainly be adopted in preference to any other. It is perfectly air-tight, compact and easy to handle, can be heated on a stove if preferred to refilling from a boiler or a kettle, and the cost only amounts to a few pence more than any other likely substitute.

The Cosy-Cover.—This is an indispensable part belonging to the hot-water container, and is seen on the right in Fig. 1. It is simply a pull-off cover of thick hair-felt and wire, and, as its name suggests, is intended to preserve the heat of the water-container. The thickness of the felt will depend upon the quality used, bearing in mind that, *the lighter the weight the better the quality*; ¼ inch thick will suffice if the material is of the best, and ⅜ inch if of medium quality. The crown or top piece should consist of three thicknesses, and the seam down the side of the cover should overlap by about an inch. The top may be made practically seamless by cutting the felt 3 inches longer than the height of the container, and then, by making slits at intervals of 2 or 3 inches all round, the strips may be turned toward the centre, and faced on either side with a disc of felt, thus completing the threefold thickness.

The wire supports—which should be fairly rigid—extend across the top and down four sides, and are stitched to the cover with stout thread ; this wire framework strengthens and keeps the cosy-cover in shape, facilitates its removal and replacement, and permits of its remaining on the floor of the brooder for the chicks to nestle against whilst the water-container is being replenished. A band of thick flannel, 3 inches deep, encircles the base of the cover ; two or three stitches will suffice to keep it in position, and it should be removed at frequent intervals and washed with warm water and disinfecting soap.

If an oil bottle is used in place of the cylindrical type of water-container, then the cosy-cover must reach to the level of the cork or cap of the bottle for the hover to rest on.

We must now revert to the kind of principal cover necessary when the brooder is intended solely for outdoor use. The paper-felt cover may be safely used if the brooder is protected from rain, snow, frost, and wind. For example, protection may be afforded under a plant-frame, which will also serve as a covered run for the chickens in the wet weather. Again, a wooden box—say 4 feet long, by 2 feet 3 inches wide, and 15 or 16 inches high, may be converted into a suitable shelter and run; the top of the box must be made waterproof, and one end may be taken out and replaced with a couple of sheets of glass and a strip of perforated zinc, *not omitting to provide plenty of ventilation all along the other three sides.* The box may be turned on end to gain access to the brooder, or the roof (of the box) may be hinged. Then again, the brooder may be stood in a greenhouse, or a well-lighted porch or outbuilding, provided that there is ample ventilation without draughts. But when such conveniences are not available and the brooder is required principally for outdoor use, then the outer cover takes the form of a lift-off wooden roof, covered with waterproof oil sheeting, and fitted with a canvas body protector. In this case the diameter should be 22½ inches, or ½ inch more than for the paper-felt cover. Tongued and grooved ¾-inch boards are used, which are held together with two cross-pieces, each 2 inches by ¾ inch, nailed across the outer side; the upper edge of the cover is bevelled so that the oil-sheet or tarpaulin with which the boards are faced may slope outwards at a sharp angle all round the edge or eaves. The piece of tarpaulin *(over which the wooden cross-pieces are nailed)* should be 24½ inches in diameter, thus allowing a clear sloping overlap of 1 inch beyond the edge of the roof; this overlap forms a shoot for the rain to drip clear of the canvas body protector, without which the rain would—owing to the roof being a flat surface—inevitably cling to the under side and eventually trickle down inside the brooder and on to the floor-stand. A few tacks inserted round the bevelled edge will suffice to fix and keep the waterproof material at a suitable angle.

The body protector simply consists of a piece of stout canvas (we use Willesden waterproof green canvas) suspended from immediately under the eaves of the brooder roof, and, being detachable, the brooder may be used either indoors or in the open. Canvas or other material of a porous nature only must be used, otherwise it will interfere with the perforated zinc ventilators round the top of the brooder. The quantity of material required is a length (or two or more pieces joined together), 68 inches long by 8 inches wide; the bottom edge of the protector, when in position, is thus about 2 inches off the ground, and yet low enough to include the upper half of the metal surround of the brooder floor-stand. A ½-inch hem is made at the lower edge, in which is inserted a length of thin jack-chain about an inch longer than the canvas itself; the chain serves the twofold purpose of weighting and keeping the canvas in shape, and of securing the flap over the chicken-exit at night-time. Oiled thread may be used for stitching the chain hem. Galvanized wire hooks (similar to small curtain hooks) are stitched round the top edge at intervals of 3 inches apart, which hook on to small wire staples or screw eyes inserted immediately under the eaves of the brooder roof. Having made and adjusted the body protector in position, it only remains to provide a flap (6 inches deep by 5 inches wide) in the canvas opposite the chicken-exit, similar to the one on the hover, as seen in Fig. 2. The chain, it should be mentioned, does not pass through the hem of the flap, but hangs loose at this point in the daytime, one end of which is passed through a small wire ring stitched on the front edge of the flap, and is hooked on to the opposite chain piece when the flap is dropped in position and secured for the night; thus the circle is completed, rendering both roof and body protector practically immovable by the worst of winds. For a lifting handle, a japanned metal knob is screwed in the centre of the wooden cover, and coated at the base with black varnish to prevent moisture lodging underneath.

Management of the Brooder.—The chief point to be attended to in the management of the Lampless Brooder is, of course, the maintenance of the heating power of the water-container. The answer to the question—'*How often should the hot water be renewed during every 24 hours?*'—depends upon the age of the chicks; whether the brooder has the advantage of indoor shelter; the outdoor temperature; the type of water-container used; and the actual temperature of the water at the time of renewal. Such are the several points to be weighed when considering the requirements of each individual case. In practice, the operator will perhaps achieve the best results by observing the following general instructions:—

(1) It is imperative that the water should be *boiling* at the moment of replenishing the container; strict adherence to this point effects a great saving in labour, inasmuch as *one renewal of boiling water is equivalent to two of a lower degree.*

(2) With a surrounding temperature as low as 45 degrees, and with chickens under one week old, the hot water should be renewed four times daily—say, 7 a.m., 12 a.m., 5 p.m., and 9 or 10 p.m. For birds between 7 and 14 days old, three renewals daily; and between 14 and 28 days old, two renewals daily will suffice, when (as a general rule) they should be passed on to the Cold-Brooder. With a ruling minimum temperature of 50 degrees, three renewals daily are sufficient during the first week, then two daily up to the ime of transferring the birds to the Cold-Brooder.

(3) The duration of the heating power of the water-container (as seen in Fig. 1) varies from eight to ten hours, according to the external temperature, and whether the brooder is exposed in the open or is under shelter; while that of an ordinary tin paraffin-oil bottle under similar conditions is less by some two or three hours, according to the manner of corking and the efficiency of the cosy-cover. A fairly large funnel is necessary for refilling the container, and the screw-cap and cosy-cover should be replaced as quickly as possible. If, instead of replenishing the container from a kettle or a boiler, it is found more convenient to heat it on a stove, care must be taken to remove the screw-cap during the process, as the special type of vessel to which we have referred is perfectly air-tight when the cap is screwed on.

(4) The floor of the brooder (i.e., the floor-stand) we cover with dry sand, and finish off with a surface layer of oat husks, short straw chaff, or hay seeds. Twice weekly the litter (sand included) is

renewed, and the floor-stand and interior of the brooder are brushed out at the same time.

(5) The flap of the hover curtain is, of course, kept turned up during the daytime, and dropped into position when closing up for the night. If the brooder is used on the indoor system, the curtain may be kept turned up all round the hover when the chicks are a week or more old, both night and day, provided that the external temperature does not fall below 45 degrees. Commence to dispense with the curtain during the daytime only, then altogether when the birds are 10 or 12 days old, always bearing in mind any violent atmospheric changes, or sudden reappearance of wintry weather. If, however, the brooder is exposed to the elements, the curtain should then be always kept in position, the flap only to be raised during the daytime.

(6) Entice the chicks outside the brooder whenever the water-container must be attended to, otherwise care must be taken not to stand the vessel on the toes of the birds.

(7) Always endeavour to feed the birds outside the brooder from the second or third day after birth. Newly-hatched chicks are soon taught to feed by sprinkling a few grains of coarse oatmeal over their backs; their attention is more rapidly attracted in this way than when the food is placed in some receptacle or on the ground, and they instinctively peck the meal off the fluffy bodies of their neighbours. A few smart 'taps' on a plate very soon conveys a meaning to them, and induces them to leave the brooder at feeding-time.

(8) Although we like to pass the chicks on to the Cold-Brooder by the time they are about a month old, yet due regard must be paid to the time of year, the general complexion of the weather, and the condition of the birds, before deciding to effect the change; and in any case it is always advisable to provide the Cold-Brooder with a vessel of hot water during the night-time until March has made its exit.

We will conclude our say on the subject by comparing the cost of equipment and working expenses incidental to the practice of artificial chicken-rearing in common use, with those attending the system here advocated.

The Lampless Brooder, by reason of the simplicity of its construction, can be made by a youth of average intelligence at an inclusive cost of 8s. or 9s. at the outside; all expense on account of oil, repairs to lamp and boiler, and renewals of lamp-wick is done away with, and with it the dirty and laborious duties attending the use of lamps; all danger of the brooder 'firing' is eliminated; and what is of equal importance, the efficiency of the appliance is such that, even when operated by an inexperienced hand, the chicken mortality should never exceed 10 per cent., as compared with the 30 to 50 per cent. of losses which occur whenever a foster-mother depends upon a lamp for its heat-supply, whether in conjunction with water, or hot-air tanks or not. Moreover, a Lampless Brooder can never get out of working order, and its initial cost is soon wiped off under careful management, as a glance at the following figures will testify :—

Lamp-Heated Brooders.

	£	s.	d.
Cost of 100-chick capacity Rearer, better class make, £3 3s.			
Oil, at 5½d. per week, for a working season of 20 weeks	0	9	2
Say, 500 birds dealt with, and mortality not exceeding 25 per cent. = 125 deaths, at a loss of, say, 8d. per bird	4	3	4
	4	12	6

Lampless Brooders.

Cost of seven Brooders (home-made) of a holding capacity of 15 birds each, at 9s. per Brooder, £3 3s.			
Oil		Nil.	
Say, 500 birds dealt with during a season of 20 weeks, and mortality as high as 10 per cent. = 50 deaths, at a loss of, say, 8d. per bird	1	13	4
Balance in favour of Lampless Brooders	2	19	2

Or a saving almost equivalent to the prime cost of equipment.

But users of the ordinary type of foster-mother know to their cost that the average percentage of losses is much nearer 50 per cent., and that a season showing anything below 40 per cent. is considered a fairly fortunate one. That such is the case the bundles of letters in our possession prove beyond all question.

If, on the face of it, our methods appear to be primitive, they are nevertheless perfectly efficient in every respect, simply because they imitate and respect—instead of transgressing—Nature's ways. The system assures to us the maximum of success at a minimum of expense; and the stock raised under such conditions rivals in health, hardiness, and rapidity of growth, that raised by the maternal hen. This much said, perhaps we may be permitted to claim for the system a more orderly, economical and uniform means of dealing with large numbers of birds than have hitherto existed in the artificial rearing department of British poultry culture.

Just a final word concerning the Lampless Brooder, and that is: The loose wooden staves, lined and put together in the manner described, and used in conjunction with the other component parts, render the appliance as a whole the most perfect imitation of the maternal hen that it is possible to conceive. *There is much more in this than might appear on paper.* And a knowledge of the properties of the various materials made use of—simple and inexpensive as they are—will, to a certain extent, explain to the reader their potentness toward the end in view, viz.:—the imitating of Nature's laws in the rearing of motherless chickens, ducklings, &c., &c.

Above all, fight shy of *metal* Brooders. As well thrust living creatures into a hot oven, as entrust the lives of tender chickens to the care of such abominations as metal poultry appliances. Some people will recommend and sell almost anything, so long as a profit can be squeezed out of it.

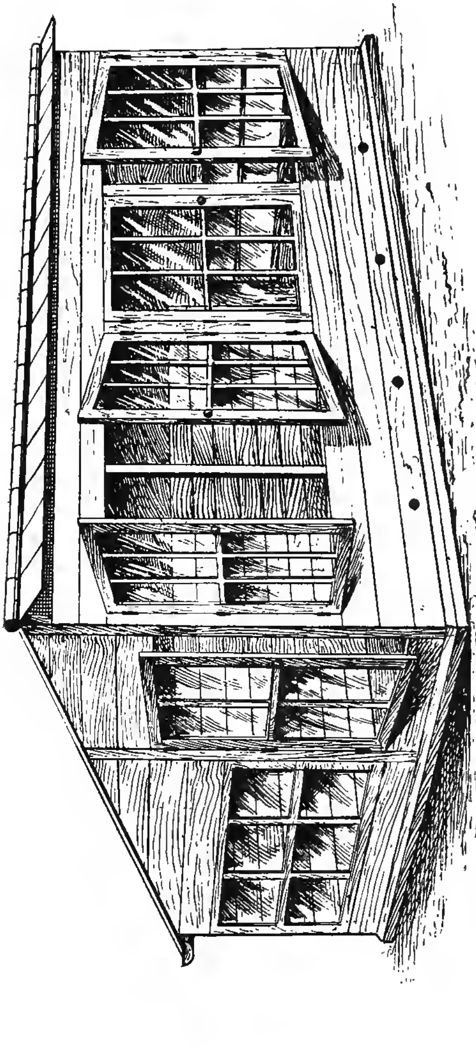

FIG. 3.

A 'Strathmore' Brooder House.

A 'Strathmore' Brooder House.

Fig. 3 represents a glass and wooden structure specially designed for accommodating considerable numbers of our Lampless Brooders during the winter and inclement weather of early spring. Not that such additional shelter is a *sine quâ non* to the successful use of the apparatus itself as an outdoor brooder, because when fitted with the weather-proof cover it affords perfect protection to the chicks in all weathers. Where, however, chickens must be raised in large numbers during the worst months of the year, not infrequently on heavy wet land and in situations exposed to the full force of biting cold winds and driving rains, then it is essential that the most efficient means should be adopted for meeting all emergencies, and for conducting operations under the most favourable conditions, if we would avoid the disastrous consequences too often courted by those who blindly trust to chance.

The structure depicted in the sketch represents the most satisfactory type of brooder-house for the use of those who would wish to follow our system in its entirety. By its aid the operator has perfect control over large numbers of birds divided into small colonies under one shelter and in all weathers, a desideratum of the first importance where time, money, and general working conditions are of consequence.

The front windows should be kept open in the daytime whenever the weather is dry and calm, care being taken to close them again at the hour of sunset, or on the approach of fog, mists, rain, or high winds. The free admission of air through the open windows even during frosty weather (unless exceptionally severe) is of the greatest benefit to young chickens housed on this system; while the conditions most fatal to chicken-life are: a close, vitiated atmosphere charged with lamp fumes; damp; and draughts.

Whenever the sun shines—if only for an hour or two daily—transfer the brooders to a sheltered position in the kitchen garden, or any available plot of turfless ground that is dry and sheltered from the east wind will do; always bearing in mind that bare earth is safer and more suitable in every respect than grass land for raising early chicken, especially in the case of birds under the age of six weeks, provided, of course, that they are liberally supplied with some sort of garden produce or tender green stuff. Those brooders containing birds of a fortnight old or more may safely be placed outdoors for an hour or two even on sunless days, so long as the air be dry and the weather not uncomfortably cold or windy; on the other hand, nothing is gained by leaving them in the open after sunset during the first eight or ten weeks of the year. And it is scarcely necessary to observe that, whenever the windows of the brooder-house are open, the door, when entering, should be closed immediately, otherwise a draught will be created and probably lead to trouble of a more or less serious nature.

The essential points to be considered in the construction of a brooder-house are: plenty of light; a sufficiency of cubic air space; proper ventilation; equability of temperature; weather-proof walls and roof; and a dry earthen floor. All these conditions are embodied in the structural arrangements of the building shown in the illustration, Fig. 3.

Specification.

Dimensions.—The size of the house will, of course, depend upon the number of brooders to be accommodated; this being determined, the shape of the roof must be left to individual taste.

In calculating the total amount of floor area necessary for the accommodation of a given number of brooders, it must be borne in mind that the dimensions of each chicken-pen should not be less than 8 feet by 2 feet, *exclusive* of the space taken up by the wire hurdles or division fences; the *width* of the pens may be advantageously increased to 2 feet 3 inches, or even 2 feet 6 inches, if means permit, but beyond that size it is not advisable to go. The pens are planned in a single, or double, row, according to width of the building; the division hurdles being only 2 feet in height, it is easy enough to step over them in proceeding from one pen to another. The house shown in the sketch is intended for a single row of pens; but if for reasons considered more convenient or economical it be desired to arrange the pens in a double row, then the roof must take the form of a full span with centre ridge, similar to an ordinary span-roof greenhouse. The following figures indicate the dimensions and holding capacity of houses intended for single and double rows of pens respectively:—

	Height.		Length.	Width.	Holding Capacity.	
	Front.	Back.			Brooders.	Birds.
Single.	7 ft. 6 ins.	5 ft.	12 ft. 6 ins.	8 ft.	6	90
	7 ft. 6 ins.	5 ft.	25 ft.	8 ft.	12	180
Double.	Ridge :	Eaves :				
	9 ft.	7 ft.	21 ft.	16 ft.	20	300
	9 ft.	7 ft.	42 ft.	16 ft.	40	600

N.B.—The number of chicks allowed to each brooder is 15.

Construction.—By the use of bolts and iron stays a brooder-house of this description of almost any dimensions may be made quite portable, thus bringing it within the legal definition of a 'tenant's fixture,' and it can be moved to a new site without fear of damaging the woodwork to any material extent.

The whole building is constructed in sections. The walls and roof are made of sound red deal match-boarding; the boards for the walls being 1 inch thick, and those for the roof $\frac{3}{4}$ inch; the thickness of the framework according to size of the building. The timber used should be thoroughly well 'seasoned' (dried) before putting together, and it is very desirable that the window sashes and door should fit to a nicety. Ordinary butt hinges may be used for hanging the sashes and door (three pairs to each) or, what is more convenient still, the sashes may be made to work on iron 'rides,' so that they can be detached at will.

The lower portion of the walls will last many years longer if placed on a plinth or base composed of 4-inch by 3-inch deal battens, which should be saturated with a mixture of hot tar and lime previous to placing in position for the house to stand on. The width of the glass-panelled entrance door facing west (see sketch) had better not be less than 2 feet 3 inches, otherwise there may be bruising of fingers when carrying the brooders in and out. The height of the door, also the size of the front and end lights, may be left to individual discretion, but the more light the better ; only the front lights open, those at the ends being permanent. After the roof is fixed it should be dressed with hot tar, and when dry covered with some really good quality roofing felt, such as 'Ruberoid,' 'Stoniflex,' &c. Galvanized ridge capping runs the whole length of the roof at the front of the house, which is fixed in such a manner that it projects by one-half its width over the top ventilating aperture above the front lights. The eaves are provided with a half-round metal gutter, with down-pipe made to empty itself into a cemented-surface channel having a good fall away from the foundations. As a protection against cats and vermin when the lights are open, and also to prevent the older birds escaping, it is advisable to have the whole of the front covered on the inside with fine mesh wire netting. [The artist has purposely omitted the wire screen in the sketch (Fig. 3) to enable the reader to obtain an uninterrupted view of the interior at the back and right-hand (east) end of the building.] The lights, when open, are held at the required angle by means of adjustable iron stays. Ample top and bottom ventilation is provided at the front. Top ventilation consists of an aperture 4 inches wide, extending the full length of the house immediately under the ridge capping, and is covered with perforated zinc on the inside. Fresh air is admitted below the windows through metal tubes 2 inches in diameter ; these tubes take the form of ordinary 'elbow' pieces, each of which is lengthened on the inside with a piece of tubing 6 inches long, fixed to the woodwork in a perpendicular position, the two pieces thus representing a capital L. The apertures for the air-inlets (tubes) are made at a point 4 or 5 inches above the wall foundation (battens), and the nozzles of the tubes are faced with perforated zinc to prevent rats gaining admission. One air-inlet (if not less than two inches diameter) is sufficient for every 6 feet run of the total length of the house.

The protection of such a structure against the effects of damp and intense cold and heat is, of course, a matter not to be overlooked. A tarred structure certainly does not appeal to one's artistic senses ; but, for our present purpose, we must be guided by considerations of efficiency and utility combined with economy. And since gas-tar possesses such excellent preservative properties when exposed to damp and the extremes of heat and cold, we strongly advise its use (in combination with lime) as a dressing for the back wall and the boarded portions of both ends and the front. The woodwork of the door and the window sashes being the parts which must necessarily be handled daily may be painted with good oil paint—white for preference. We now come to the interior.

A skirting of galvanized iron (ordinary roofing sheets) 18 inches deep, runs right round the inside of the building. A light gauge

(No. 26) is quite strong enough for the purpose, and if purchased in 9-feet lengths it can be cut into suitable pieces at less cost than any other stock size. The extreme width of these sheets is usually 26 inches, but when fixed the width is reduced to 2 feet, the overlapping accounting for an inch at either side. The corrugations should be flush with the woodwork, similar to the skirting-board of a dwelling-house. This metal lining not only renders the chicken-pens proof against draughts due to the possible shrinkage of the jointed boards, but also contributes to cleanliness, prevents insects taking refuge in the interstices of the walls, and makes it possible to use the limewash brush more frequently exactly where it is mostly required, without the necessity of saturating the woodwork with moisture. Then, with the object of maintaining a temperature as equable as possible, the roof-ceiling and that portion of the boarded walls above the metal skirting should be papered with damp-proof brown paper ; the 1-ply quality being perhaps as serviceable as any. Although not exactly necessary, it certainly improves the general appearance of the interior when the papered surface is either distempered or limewashed ; the ceiling, say, white, and the walls a pale blue-green.

The front lights being movable, the temperature of the building can be reduced to a normal degree even on the warmest days that are likely to be experienced in winter or spring ; also bearing in mind that these are the days when the chicks and brooders should be placed out in the open as already advised. With regard to the protection of the glass portion of the house in the night time, means must be adopted towards the exclusion of frost as far as possible. For this purpose we use green canvas blinds, the rollers of which are fixed inside just *below* the top ventilator, so that the blinds do not in any way interfere with the perforated zinc-covered aperture. An excellent substitute for the more expensive green canvas is that of coarse, unbleached calico, treated as follows : immerse the calico in cold water and leave to soak for 24 hours ; after wringing out the moisture, soak the material for two or three hours in a bath of green dye (such as is sold for household purposes, and then hang it out over a line in the open and leave until *thoroughly dry* ; the surplus dye water should be allowed to drain off the calico while on the line, and not be wrung out, or the finished article will probably present a patchy appearance when dry.

When perfectly dry and ready for use, make up the material into blinds in the ordinary way, not forgetting to insert a substantial lath in the pocket at the bottom edge. In practice, the blinds are let down every evening during the winter and early spring, or so long as frosts are in evidence, raising them every morning as soon as daylight appears. By the use of good rollers, fittings, and stout cords, blinds of this description up to 3 yards wide can be manipulated with ease.

The divisional fences for the chicken-pens consist of fine-mesh wire netting, fixed either to a light framework of wood or wire rods. The ends of the hurdles are slid into grooves formed of wood strips fastened to the woodwork at the back and front of the house at intervals of 2 feet (or 2 feet 6 inches) apart. In the case of a building designed to accommodate a double row of pens, the pens extend from front to back as just explained, and are intersected down the centre with short hurdles made to the exact width of each enclosure; pieces of copper wire (or twine) will suffice to hold the centre hurdles in position.

The only remaining question to be considered relates to the composition and construction of the floor, a matter of the utmost importance where indoor chicken-raising is concerned. It is unnecessary to discuss the cause or causes of failure which so often puzzle the minds of those who attempt to rear chickens restricted to the daily use of any but an earthen floor. We may, for a time, succeed with such work on a wood, stone, or brick floor; but sooner or later numbers of the birds will develop signs of leg weakness, and though the affected subjects may eat well, and appear well in other respects, yet they not infrequently will sink and die, with a suddenness as appalling as it is mysterious to the novice in poultry culture. The floor, then, of the brooder-house must consist entirely of mother earth; and the manner of constructing what we have for many years found to be the best of all floors for the purpose in view is as follows:—

If the soil consists of a natural bed of sand or gravel, the floor —other things being favourable—may be considered as being ready-made, and nothing more remains to be said. Where, however, the surface soil or immediate substratum consists of clay or a heavy marl, or is in any way inclined to retain moisture for long, it will be necessary to remove such soil to a depth of 18 inches, and have it replaced with a 12-inch layer of sand on a 6-inch foundation consisting of brickbats, clinkers, or other materials of a similar kind. Where the site is a low-lying one, and it is found necessary to raise the floor above the natural ground level, the floor area thus formed should exceed that to be occupied by the building by a clear 12 inches or more on all four sides, so as to allow for a slope or fall for carrying off surplus moisture near the wall foundations The upper layer of sand having been well rammed down, and everything made as firm as possible, the battens for the house to stand on are then cut to the required size and placed in position, when the erection of the building may be proceeded with on the lines described in the specification.

In practice, we litter the floor of the chicken-pens with short cut chaff, oat husks, chaffed bracken, hay seeds, &c. Straw, unless cut short, is both wasteful in use and of far too clumsy a nature as litter for such small stock as chickens. The surface litter should be replaced with fresh material at least once every week. At the conclusion of the breeding season the divisional hurdles may be removed and left to air and sweeten in the open before storing away until wanted again; and the surface sand or other earth of which the floor of the house consists should be removed to a depth of 3 or 4 inches, and powdered quicklime sprinkled all over the floor *before* fresh earth is put down in the place of that taken away; in other words, *the surface soil of the brooder-house must, under all circumstances, be renewed every year.* These matters having been duly attended to, and the walls swept and limewashed, the building is then at liberty for any other purpose during the rest of the year, *the housing of any other kind of live stock excepted.*

To Exclude Rats.—Wherever chicken-rearing is practised these rodents are also often in evidence; and not being content with the crumbs of the chicken menage, they will, as many farmers know to their cost, burrow under the foundations of an outbuilding, knaw their way through an inch board, and carry off a whole brood of birds in the course of a single night. But here is a barrier which we have never yet known a rat or a stoat to pass: it simply consists of chloride of lime put down like a train of gunpowder round the building to be protected. In the case of a brooder-house the chloride should be placed immediately under the battens which support the walls of the house—not on the surface of the ground or inside the house itself. Buried in such a dry position, or placed inside holes in the walls or floors of buildings, chloride of lime will remain fairly effective for many months, and where it exists rats are generally conspicuous by their absence. We would, however, utter a timely word of warning to those who might think of using the chloride in rat-frequented rooms of a dwelling-house, and that is—'Don't!' as Mr. Punch would say; unless, of course, you would have your fire-irons and the steel tops of fenders, &c., rendered all rusty, or the gilt figures and decorations disappear from your tea china, dessert service, gilt ornaments, and other treasured household articles of a like nature.

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COLD-BROODERS.

Our system of chicken-rearing under artificial conditions would scarcely be complete in all its essential requirements without providing adequate accommodation for the birds when they are ready for the hardening-off process.

The horticulturist knows very well that the subsequent success of his tender seedlings depends, in a great measure, upon the careful and systematic manner in which they are gradually hardened off. But there are hundreds—nay, thousands—of poultry breeders who rarely give a thought to the day when their chicklings must quit the foster-mother, with the result that the birds are coddled in heat long beyond the time when they should have been transferred to more natural and healthy surroundings. Such a practice is bound to lead to irreparable mischief, since it weakens the birds, exercises a most detrimental effect upon their natural growth and development, and renders them an easy prey to disease at every stage of their existence. It is no uncommon thing for breeders to coop their chickens in the foster-mother until they are nine or ten weeks old, whereas, in the right order of things, they should be transferred to fresh quarters at the age of four or five weeks, according to their condition and the state of the weather.

We will now proceed to describe some of the home-made appliances which we utilize for hardening-off and schooling the birds, from the time when they leave the foster-mother until the day arrives for separating the sexes and transferring them to more roomy quarters.

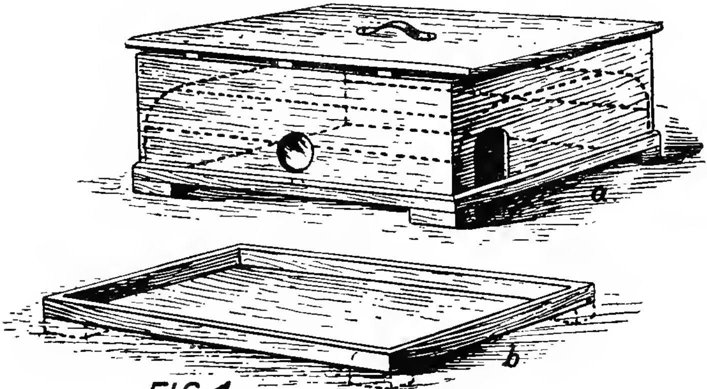

FIG. 4.

A 'Strathmore' Cold-Brooder.

The illustration represents an ordinary Tate's sugar box, altered and fitted up as a Cold-Brooder. The dotted lines show the internal arrangements, which simply consist of a movable hover made of wire work, soft felt, and damp-proof paper. Fig. B represents a loose floor-stand on which the brooder is placed when in use. In Fig. A, the brooder is seen in position on the floor-stand, which is raised off the ground on bricks at the four corners.

Specification.

The Carcass.—Procure an undamaged box of the kind mentioned, not forgetting the lid or cover belonging thereto. When transformed into a brooder, the carcass really consists of four side walls, provided with a loose roof and a movable floor-stand, having a narrow ledge all round. In order to obtain the largest possible amount of floor space, the two sides having the greater surface (usually 20 inches long by 17 or 18 inches wide, inside measurement) must be carefully removed, and the boards which formed the cover should then be replaced and nailed firmly together again. We have now a structure with four side walls (minus, as yet, both floor and roof) *which must be made absolutely proof against damp and draughts.* This may be accomplished by papering the whole carcass (inside and outside) with stout brown paper, and then covering with a mixture of hot tar and slaked lime. The paste for the paper should have a little 'size' added to it, and the tar, when hot is then mixed with about one-fourth its bulk of lime.

When the work is perfectly dry and hard, proceed to cut out the holes for the window and the chicken-exit, or they may be made before the paper and tar are applied, according to the will of the worker. A circular shaped window, perhaps, improves the appearance of the finished article, and a useful size is one of 3 inches in diameter, cut so that the lower edge of the circle is exactly 3 inches above the floor level. The shape of the glass itself is immaterial, so long as the size exceeds that of the window opening by at least 1 inch all round; it may be fixed permanently (at the outside) or it may be arranged to slide to and fro in grooves of zinc or tin. When the paper and tar on the inside walls are dry and hard, finish off with a coat of limewash containing a little 'size' and a pinch of ordinary washing blue.

The chicken-exit is provided with a sliding door consisting of a piece of perforated zinc, the rough edges of which may be bound with a narrow strip of tough paper secured with 'Seccotine' or glue, and then brushed over with black varnish. The perforations in the zinc door admit a gentle current of fresh air, which drives out the foul air immediately under the roof of the brooder.

The Floor-Stand.—We certainly prefer a movable floor-stand to the fixed floors in common use, designed on the same principle as that of the lampless rearing apparatus; the only difference in this case being one of shape, which must, as a matter of course, conform to that of the brooder itself. It should be larger than the carcass by an inch each way, so that the latter may be lifted bodily off the stand with ease; and the depth of the surrounding ledge or skirting within which the carcass or body of the brooder is placed should not exceed 1½ or 2 inches at the most. The skirting, which is nailed to the edges of the floor-stand, may consist of strips of red deal ¾ inch thick, or, better still, galvanized sheet iron may be used. The under side should be dressed with two coats, and the upper side with one coat, of the tar and slaked lime mixture, and then allowed to dry quite hard in the open air before putting the brooder to practical use.

The Roof or Cover.—As these brooders are intended to stand under a covered shed of some sort (see Shelter and Chicken-Runs illustrated further on), the roof may be made flat, which simply consists of a loose wooden cover, sufficiently large to project 1½ inches or so beyond all four sides of the body of the brooder; paper both sides, and dress with the tar-lime mixture as recommended for the other portions of the work. The roof, when in position, must not fit close, but should rest about ¾ inch off the top edges of the side walls, so as to provide an opening for ventilation on all four sides as seen in Fig. A. This may be effected by making the strips of wood which hold the roof boards together of the same length as the width of the roof itself; the strips or cross-pieces should be ¾ inch thick, and, as they are fixed to the under side of the loose cover or roof, there is thus a clear ¾-inch opening for top ventilation all round. A handle, or knob, fastened on the top of the cover, completes the external construction of the appliance.

Internal Fittings.—The only internal fitment consists of a movable hover or wire framework, covered with a thick pad of felt and damp-proof paper.

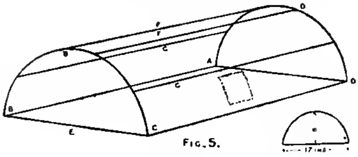

Fig. 5.

‘Hover’ Frame.

Fig. 5 shows the shape of the wire frame, and the space within the dotted lines corresponds with the position of the window at the front of the brooder ; this space must, of course, be left uncovered, the pad being cut to shape before it is attached to the frame. Extreme height, 8 inches ; the other dimensions should be an inch less than the inside measurements of the carcass, to allow for the space occupied by the pad, and to facilitate the removal of the hover without injuring the cover.

The wire for the frame should be fairly strong and rigid, of about the same gauge or thickness as ordinary telegraph wire. The frame consists of 4 or 5 lengths of wire (according to the skill of the maker), and a reference to the lines indicated by the capital letters in Fig. 5 will explain the method of construction. The principal wire should be 10 feet long, and may be bent to the required shape as follows : Commence at A, turn at point B, and follow the half-circle round B to C, continuing along the second straight line from C to D ; turn again for the formation of the half-circle round D to A (the starting point), and back again to D along the base. The end piece E (which may be omitted altogether if the principal wire be strong and rigid) is a separate length, and should be about 20 inches in length to allow for twining round the ends at points B and C. The wires F F should be placed a good 2 inches apart, and with a little ingenuity they may be formed out of a single length of about 4 feet in all. The two remaining wires G G are the side supports for the felt and paper cover, and should be placed about 5 inches from the base or floor level. The shorter lengths may be prevented from slipping out of position by securing them with solder, fine copper wire, or even ordinary twine and a little ‘Seccotine.’

We now come to the lining or covering of the framework. The space between the top wires F F is the point of ventilation in the roof of the hover, and the wires indicated *should not be less than 2 inches apart from end to end.* Over this space either a piece of greenhouse scrim (coarse, open mesh) or perforated zinc is placed, and the sides and ends (window and exit positions in the brooder excepted) are covered with felt and paper pads. Should the scrim or other textile material be used, then the upper edges of the side and end pads may be stitched to the overlapping edges of the roof strip, so as to form four loose side flaps in one piece, *always taking care not to overlap or in any way interfere with the scrim-covered space between the wires F F ;* a tie here and there will suffice to keep the whole cover in position when attaching it to the hover frame. The felt pads should be an inch less than the outer paper covers all round, and the materials are merely held together with two or three stitches of cotton at each corner, and perhaps a stitch in the centre, as it is not at all necessary to bind the edges of the felt with the paper. *The pad near the chicken-exit should be cut and shaped so that it will not in any way obstruct the current of air admitted through the perforated zinc door.* A wire handle attached to the top of the framework completes the fitment.

Brooder Shelters and Chicken Runs.

WITH the aid of some sort of covered shelter, chickens, when four or five weeks old, can be reared in these home-made cold-brooders with the greatest success during the most inclement weather. Indeed, we rarely lose a chick under the conditions of housing and management here advocated, a circumstance which we attribute to the birds not having been coddled under unnatural conditions from the day they were hatched.

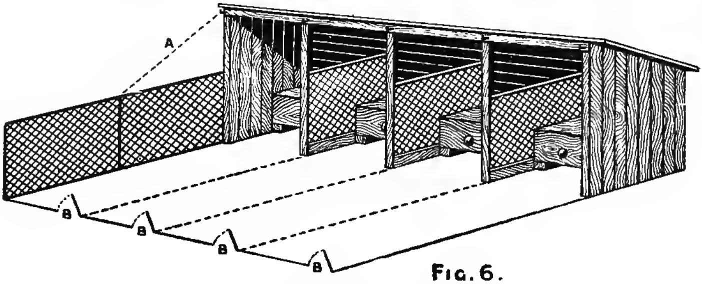

FIG. 6.

Shelter for Cold Brooders, with range of Chicken-Runs.

Fig. 6 represents an inexpensive form of shelter suitable for a range of chicken-runs equipped with cold-brooders of the type just described.

Specification.

Shelter.—Height at front, 6 feet; height at back, 5 feet; depth from front to back, 5 feet to 6 feet. Constructed of tongued and grooved red deal; ends and back of 1-inch stuff, and roof $\frac{3}{4}$-in.; frontal supports, 2 inches by 3 inches or 3 inches by 3 inches, according to length of the whole range. Made as portable as possible by fixing together with bolts. Outside walls and supports to receive two coats of hot tar-lime mixture, inside one coat. Roof covered with waterproof felt. When the inside walls are quite dry and hard, finish off with a coat of limewash.

Yards and Fences.—Size, anything from 12 feet to 20 feet in length, by 4 feet to 6 feet in width, according to space at command. Fencing consists of hurdles 4 feet high, covered with 1-inch mesh wire netting, or $\frac{5}{8}$*-in. mesh where rats are troublesome.*

The dotted lines indicate the positions of the divisional fences (see Fig. 6), which extend right up to the back of the shed. In order to keep the yards dry immediately in front of the shed, a length of tarpaulin or waterproof canvas may be hooked on to the front and stretched at a sharp angle to the fences as indicated by the dotted line marked A. The openings, or broken lines marked B B, &c., represent the entrance gates, and the brooders are seen in position at the back of the shed.

Situation and Soil.—An open situation, with a south or south-western aspect (if on a gentle slope so much the better), is the best for chicken-rearing purposes. Avoid the immediate shelter or drip of large trees; such natural shelter is welcomed by the birds during the heat of summer, but in early spring the young growing stock should have the benefit of every ray of sunlight. The most suitable soil is, of course, one of a sandy nature; clay, or heavy retentive soils should be avoided whenever possible. Heavy land, however, may be rendered fit for use as chicken-runs by digging cross trenches, 6 inches deep by as many in width, at intervals of every 3 or 4 yards, and then covering with a thick layer of sand, or sand and broken mortar rubbish mixed. *The same plot o ground should never be used as a chicken-run two seasons in succession, unless the surface soil has been removed and replaced with fresh material.* The old plot should be limed and cultivated as a vegetable garden for a year, when it may be safely used again as a rearing ground the following season.

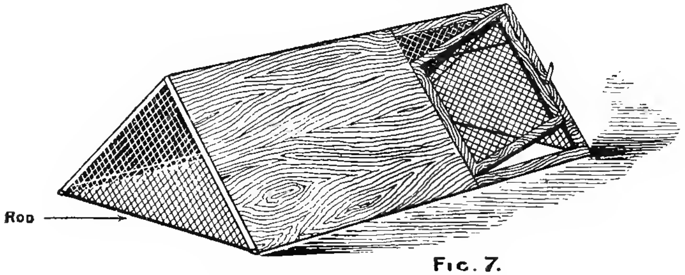

Fig. 7.

Portable Folding Cold-Brooder Shelter.

Fig. 7 represents a useful form of movable cold-brooder shelter for use on the 'colony' system, and one well adapted to the requirements of those poultry keepers whose operations are conducted on a more limited scale.

Specification.

Size, 6 feet to 8 feet long, by 4 feet to 4 feet 6 inches wide at the base of the apex, and 4 feet high. The framework is in two parts (similar to a two-fold screen), hinged along the top with two or three pairs of stout butt hinges, and can be folded flat when not in use. The covered portion extends 4 feet of the total length, and the covering materials consist of 'Willesden' two-ply rot-proof paper, pasted over a foundation of coarse canvas, unbleached calico, or stout scrim. A single application of tar-lime mixture will render the roof proof against heavy rains. The shelter is enclosed at both ends with small mesh tanned fruit netting, and a stout wire rod (plain fencing wire, No. 4 or 5 gauge will do) is inserted through the mesh of the netting at the base of the apex, with the twofold object of holding the netting taut near the ground, and keeping the shelter in position at the required angle as seen in the sketch. The attachment may be made by twisting the ends of the rod into a loop, through which a screw (faced with a loose metal washer, or pieces of tin or stiff leather of the size of a shilling-piece will do) passes for fixing to the wooden frame. The brooder, of course, stands inside the covered portion, access to which may be obtained by simply dragging the shelter along the ground from right to left until the brooder appears opposite the door. The size of the door should not be less than 3 feet by 2 feet, so that the brooder and inmates may be examined or removed without the necessity of tilting the shelter over.

Management of the Cold-Brooder.

(1) The floor of the brooder should be raised 3 or 4 inches off the ground on bricks or other supports impervious to moisture.

(2) Cover the floor-stand with a good inch layer either of dry sand or *burnt* clay, and finish off with a top layer of oat husks (farmers and millers often have such for disposal), short chaffed straw, or pine saw-dust—the husks or chaff for preference. Peat-moss litter is right enough for the houses of adult birds, but for chickens we avoid it, owing to its dusty nature, and also because it acts as an internal irritant when passed into the stomachs of the birds with their food.

(3) Renew the surface litter twice, and the bottom material once, weekly. To do this, all that is necessary is to remove the brooder bodily off the floor-stand, when the latter may be taken right away to the rubbish heap, emptied, swept with a hard brush, and then sprinkled with a little powdered lime before renewing the litter and replacing in position.

(4) The hover (internal fitment) should be removed once or twice daily to see that nothing is amiss, and occasionally it should be aired in the sun or before a kitchen fire. When the weather gets warmer, the air space of the hover may be increased by raising it two or more inches off the floor, and resting it on side supports consisting of long screws or nails inserted half their length in the sides of the brooder.

(5) Always keep the scrim-covered ventilation space at the top of the hover free from obstructions, and never omit to close the chicken-exit before dark every evening.

(6) Never place any kind of food, water, or other perishable matter inside the brooder. The shelter is the proper place wherein to feed and water the birds, the floor of which should be covered

with a good layer of sand ; a little loose litter, such as dried bracken, hay seeds, &c., should also be put down in the shelter for the chicks to scratch among.

(7) Not more than 12 chicks (at a month old) should be housed in a box of the dimensions named ; and weather permitting, they should be finally transferred to the fowl house when eight or nine weeks old, or sooner if circumstances justify.

(8) Cleanliness ; regularity in feeding ; protection against damp ; prompt attention to, and the removal of, any birds showing the slightest symptoms of a cold or other ailment ; the provision of perfectly clean (boiled) water, sharp flint (or granite) grit, and fresh greenstuff daily ; and a well-balanced diet of sound, plain, wholesome, staple feeding stuffs, supplied in just sufficient quantities to satisfy the hunger of the birds—these constitute the cardinal points to be observed in the feeding and management of chickens intended to thrive and develop into strong, healthy, and profitable birds, at a minimum cost and a maximum of pleasure to the owner.

PART II.

The Economic Production and Preparation of Home-Raised Poultry Feeding Stuffs.

The food bill is undoubtedly the most serious of all items which the rank and file of poultry farmers have to face. With agriculturists, especially those who cultivate large areas of cereal crops, the case is vastly different, as the farm may be said to carry the poultry rent free, and the rick-yard, barns, pig-styes, and the stubbles, all contribute their quota towards the birds' daily food requirements. But where poultry-keeping is the mainstay of a purely business venture, and every ounce of food must be bought, then it behoves us to be up and doing, and to see that every square yard of the soil at disposal shall be put under cultivation and utilized to the best possible advantage, with the object of reducing the food account as far as circumstances will allow.

In so far as affects the facilities for the production of food for stock at first cost, the poultry farmer with nothing but grass land at his command is certainly not nearly so well placed as one who rents—or owns—an acre or more of arable land. Readers of 'POULTRY EMANCIPATED' will, of course, be fully acquainted with the dual system of Poultry-Gardening therein explained and advocated for the first time in the pages of any book or periodical devoted to live-stock literature.

Perhaps this part of our work will scarcely appeal to those who merely keep a few head of poultry for pleasure or home supply, because the cost of feeding birds thus kept is reduced in proportion to the quantity of house scraps which happen to be at the owner's disposal. The subject is, however, an all-important one to those who farm poultry as a business speculation, and is one which has certainly been sadly neglected by British poultry farmers.

In 'POULTRY EMANCIPATED' we laid particular stress on the importance of keeping fowls for egg-production on the garden-farm principle, instead of penning them in *grass* enclosures. In this we had opposed to us practically the whole of the recognized poultry authorities, both of this country and America, who, one and all, advised grass in preference to arable land for poultry. During the past year, however, we have noticed with pleasure that several poultry lecturers have adopted our own view of this matter, and to-day they are expounding to rural audiences the advantages of arable land for poultry-keeping purposes. If anything, experience convinces us more and more of the correctness of our past teachings concerning not only the choice of the land itself, but also the breed of the birds with which it is stocked; and this is scarcely to be wondered at when we see with our own eyes a first-cross laying hen returning a profit of 8s. to 10s. per annum on arable land, as against the 3s. or 4s. earned by a pure bred bird kept on stale—if not disease-laden—grass land.

How to Economize in the Production of Poultry and Eggs.

THERE are two ways whereby it is possible to cheapen the cost of production of eggs and birds for the table, viz.: (1) By utilizing the soil for the production of cereal, root, and vegetable crops at first cost; and (2) by improving the feeding properties of such products, to be effected by subjecting them—or some of them—to such processes as fermentation, cooking, malting, and a judicious system of blending and admixture, according to the specific purpose for which they are intended.

We refrain from submitting a table of analysis of the comparative values of stock-feeding stuffs, for although such information is undoubtedly useful to the intelligent stock-keeper up to a certain point, yet too much reliance should not be placed on cut-and-dried knowledge of that kind, because in practice the results not infrequently tell a very different tale to what an analysis would lead us to expect.

Instances come before us almost daily, where peasants engaged in poultry-raising are perfectly ignorant of the chemical constituents of the various feeding stuffs which they use, and yet they nearly always contrive to make their little business ventures a real success; a fact which must be attributed to their aptitude for testing the merits of various systems of feeding, blending the staple articles of diet with all manner of vegetable substances, and duly observing the results of their labours and the general conditions under which they were conducted. In this way, then, do these industrious folk find out for themselves *how*, and *when*, to utilize foods to the greatest advantage. They do not stop to explore the mysteries of scientific research as expounded in books, since a life experience in the feeding and management of their stock has solved for them the problems which all the book-learning in the world could never have solved.

On the other hand, we know of educated people engaged in the poultry industry who, in the feeding of their stock, slavishly follow the inferences drawn from the information contained in elaborate tables of food analyses; but as often as not these deducements only led them astray, as the contents of their letters to us proved beyond all doubt when eventually they explained their difficulties. Of course, the analyst is not to blame; he presents us with a basis upon which to work, and there his functions end. Science and practice are but two different methods of discovering a truth; and whilst the one may assist the other, yet can we only learn to any real advantage by observing in daily practice the actual effects produced by this or that mode of procedure under many and varying conditions.

Like the self-taught peasant, whose daily companion and guide is practical experience, we have no time for cramming the mind with a mass of theoretical data of an encyclopædic order. It is experience of the *practical* order which has unerringly taught us the value or worthlessness of one system and another, thus enabling us to record and preserve for future reference a string of concrete facts which, when analyzed, serve to emphasize the truth of our assertion that—theory and practice are very apt to disagree with each other.

Useful Crops to Cultivate.

The variety of cereal, root, and vegetable crops more or less valuable as food for poultry is almost endless. Among those which may be utilized to advantage are: wheat, barley, oats, rye, peas, buckwheat, maize, dari, kidney beans of all varieties, rice, lupin seed, sunflower seed, hemp seed, canary seed, and millet; potatoes, parsnips, carrots, beet, mangolds, and turnips; onions, vegetable marrows, cabbage, lettuce, watercress, &c., &c.

With but few exceptions—such as dari, rice, and millet—the various crops enumerated may be cultivated to perfection in most parts of the British Isles.

Among other articles of food and corrective agents of considerable value to the poultry-keeper are: orchard produce, such as may be too small or otherwise unfit for market; and the *marc* or residue of fruit pulp from which the juice has been expressed when making cider, wines, &c. Clover hay, dandelion, rue, and the green tops of the broom plant; nettles, wood sorrel, vine cuttings, elm leaves, &c., &c. Also acorns and beech-mast when shelled, both of which are plentiful in many localities.

How to Increase the Nutritive Properties of Feeding-Stuffs.

As previously remarked, it will be generally found in practice that many of the products common to the field and the garden can be turned to more profitable account by first subjecting them to such processes as cooking, malting, or partial fermentation (according to the nature of the produce to be treated), and afterwards blending them with raw products of another kind, than if served to the stock without regard to any such preparation and admixture.

But it should be distinctly understood that this system of feeding laying stock ought not to be abused by resorting to it every day throughout the year. Perhaps the best results are obtained by practising it, say, twice weekly during the summer months, and on alternate days during late autumn, winter, and early spring, *always taking care to vary the rations of both the prepared and raw materials as often as possible, otherwise much of the advantage will be lost.* In all cases the results should be carefully observed and duly recorded in writing at the end of every week.

Another important point to be borne in mind is: The same foods, or systems of feeding, do not always have a corresponding effect on *all* breeds of fowl alike. This being an established fact, the poultryman will do well to make a note of any such differences as they arise, also of the nature of the soil, and period of the year when recording these data.

Effects Produced by Cooking.—By subjecting maize corn, for instance, to 185 or 190 degrees of heat, the albuminoids are transformed into more digestible matter, thus enabling poultry to reap the full benefit of its nutritive properties. Maize should be cracked or slightly crushed (not ground) before cooking.

The same remark applies to beans, peas, acorns, and beech-mast, all of them rich in albuminoids and carbo-hydrates; the chemical properties of these four products undergo a great change after cooking, the process apparently tending to develop in them meat-making properties (eggs) rather than fat or offal.

Bran, and the meal of maize, barley, peas, and beans are all much improved by *steaming*, and admixture with a small proportion of potatoes, carrots, beet, &c.; the steaming of these meals also imparts an appetizing flavour to the whole mash.

Effects Produced by Fermentation and by Malting.—When such succulent roots as those just mentioned are *steamed* (not boiled), and then allowed to lie in a solid mass for a few days in a temperature of 60 degrees or more, a large proportion of starchy substances is freed and converted into saccharine matter; and if a smaller quantity of sprouted (or malted) barley be mixed with the other ingredients, the starchy matter is rendered still more soluble and digestible. Precisely when this transition occurs—i.e., the vital alterative effect on the food—is not (to us) exactly certain; but in all probability the final process is effected in the stomach, somewhat in the same way in which malt acts in the vat of the brewer.

However, the fact remains that food so treated is eventually turned to the very best account, since the effect is to convert indigestible matter into digestible and nutritious food. Barley itself, when malted, has about 20 parts of its starchy constituents converted into saccharine. Fresh sprouted barley is of great value as a poultry food for egg production, especially when judiciously combined with other kinds of grain, ground or entire.

The immense gain derived from this systematic treatment of certain kinds of food is patent enough in its application to such feeding stuffs as bran or pollard, when mixed with prepared potatoes, beet root, mangolds, carrots, or parsnips. Bran, say at 14s., or pollard at 12s., per sack of 280 lb. respectively, if mixed with malted or fermented roots, is, relatively speaking, a much more economical and satisfactory ration than barley-meal—say at 21s. per 280 lb.—when used alone, even allowing for the extra labour attending the preparation of the mixture. Moreover, this economy does not merely lie in the difference in first cost of the articles mentioned, but also shows itself in the results which follow, both as regards the egg yield and general health of the stock.

Orchard Produce.—In the list of feeding stuffs we included the waste or unsaleable produce of the orchard, and the marc or by-product derived from wine or cider-making.

It is common knowledge that many authorities on poultry culture object to the use of apples as food for poultry, on the ground that they make the birds thin. But this contention can only hold good where fowls have free access to land strewn with fallen fruit for several weeks together, and when the owner curtails their usual rations to such an extent that the birds get ravenously hungry, with the natural consequence that they partake of the fruit to excess. The fault does not lie in the fruit, but with the owner, who imagines he is economizing by cutting off the corn and meal supply for a time.

We know very well how beneficial are the effects of apples—or any other fruit—when given occasionally and in moderation to the laying stock; and especially is this the case with the older birds, or such as may have put on too much fat during the summer months.

Used in the manner indicated, apples tend to increase the activity and power of the animal organism, keep the liver in order, diminish the waste of tissue, and cool and cleanse the blood of the birds in a manner unattainable by the use of poultry nostrums.

It is, however, very desirable that fowls should not have daily access to an orchard strewn with fallen fruit during the moulting season, the days when they require much nourishing food and careful dieting, as the acidity of the apples—if allowed *ad lib.*—would, to a certain extent, counteract the effects of the former. The safest and most economical plan to adopt where large quantities of unsaleable apples are available is to collect the greater portion of the fallen fruit every morning until the fruiting season is over, and have them stored away in a cool shed or other outbuilding for use later on.

Fruit marc—i.e., the residue of such produce as apples, pears, grapes, gooseberries, rhubarb, &c., from which the juice has been expressed for conversion into cider, perry, or wine—also makes a useful addition to the rations of laying hens. It should be used when quite fresh, as all such substances undergo a rapid chemical change, and are soon rendered unfit for any other purpose save that of manuring the land; that which cannot be conveniently utilized when fresh, may be evaporated, dried, and stored for future use.

The Uses of Clover Hay, Herbs, Leaves, &c.—We once heard of a person who solemnly declared—in cold print, too,—that 'clover-meal was a grand thing for egg-production.' The endeavour to create a demand for this stuff reminds us of the ingenious Frenchman and his famous flea-powder, which, if report be true, consisted of nothing more harmful than—*brickdust.* But by what mysterious process such an article as clover can possibly be transformed into 'meal,' passes one's understanding. Clover *dust* it may well be, but meal—never; and clover hay ground to powder, with every particle of its useful properties destroyed, would, we imagine, constitute about as useful a commodity as that of the Frenchman's creation. However, let us stick to utility, poultry, and a rational system of feeding, and leave such items as 'clover-meal,' brick dust (and fancy feather-dusters) to those who look upon them as 'grand things for egg-production.'

Now, a hen's egg contains a certain proportion of iron salts and phosphates; so also do the flowers, seeds, stems, and leaves of many species of grasses, plants, weeds, &c., &c. But in the dead of winter, when eggs are dearest, too, the domesticated fowl is denied these valuable additions to its dietary, with the result that the organs of production are rendered more or less incapable of responding to the call made upon them by those owners who yearn for eggs in plenty throughout all the four seasons of the year.

The question is, then, how are we to supply these deficiencies when most needed? The answer is: By cutting and drying in summer, and carefully storing under cover for winter use, all such field and garden produce as—Red and Dutch clover; mixed meadow grasses, cut and harvested as soon as haymaking begins, or just when the flowers are at their best and before the seeds are fully ripened; the green tops of the common broom; dandelion, both roots and leaves; rue, hops, groundsel, nettles, elm leaves, and the prunings of the vine, the thorn, and the wild or dog rose.

Then, on the approach of winter, make judicious use of them (the more varied in kind the better) by extracting their nourishing and medicinal properties in hot water, and mixing the liquor (diluted) with the morning mash two or three days every week. In this way are we able to assist Nature at a period when assistance is of the utmost importance ; for it should always be borne in mind that domesticated fowl are, to a great extent, unable to supply their own natural wants under the conditions to which man has accustomed them.

The manner of *blending* and *mixing* poultry foods is fully dealt with in 'POULTRY EMANCIPATED,' therefore it is unnecessary to repeat such information on the present occasion.

Preparation of the Raw Materials.

Cooking.—All roots and vegetables are best when *steamed—not boiled.* Steaming dissolves and frees the starchy matter much better than boiling, the latter process having a tendency to hold, rather than set free, the starch, owing to the absorption of so much water and the violence of its ebullition ; besides, the absorption of much moisture not only diminishes the nutritive properties of the food, but is also detrimental to its after-treatment by malting or fermentation.

When roots in large quantities have to be cooked, a proper boiler with steam-box attachment is almost a necessity, but for small lots there are several suitable types of steaming apparatus which may be obtained at a moderate cost. An ordinary steam-jacketed cooker may be used with success, which, however, *bakes* rather than *steams,* unless, of course, water is also added to the inner vessel, when the process really amounts to boiling. If this type of apparatus is chosen, then a loose iron grid should be fitted inside the bottom of the boiler, and if raised on feet some 5 or 6 inches off the bottom, the intervening space will hold water sufficient to create steam for permeating the mass of roots above, thus avoiding the alternatives of boiling or baking. We have used four such cookers fitted with grids in the manner described, and the arrangement answered admirably. When the food is simply baked (i.e., in the hot air of the cooker) it is necessary to add moisture when making up the fermenting heap ; whereas the moisture absorbed during the process of steaming not only contributes to the production of a much better article, but also facilitates the handling and management of it while in the fermenting heap.

Any of the roots referred to may be cooked in this way for malting or fermentation ; and when two or more kinds are available for the purpose they may, by way of a change, be cooked and treated together instead of using them separately. A few smashed acorns or beech-mast (after shelling) may also be added and steamed at the same time ; the shells will part readily after the mast has been stored for a few weeks in a heap of moist sand.

Potatoes ('thirds' or 'chats' are good enough) and beet should be cooked whole, but turnips, parsnips, and large carrots should be sliced, for which purpose a spade will do in lieu of a slicing or pulping machine. All roots should be washed before cooking, and care must be taken not to cut or break the skin of raw beet, or it will bleed and the flesh be drained of much of its nutritive matter.

The process of cooking must be kept up without interruption until the largest pieces are just tender, and no more. If the temperature of the steam be allowed to alternate between high and low, the chemical action thus produced tends to hasten decomposition rather than favour a wholesome fermentation of the stuff when removed for the finishing process. The roots should be transferred to the store-heap as soon as they are tender, when they are ready for fermenting or malting, as the case may be.

Fermenting.—The simple process of fermentation may not be quite so productive of good—i.e., ultimate profit—as when a portion of malted, or sprouted, barley has been added to the roots after transference to the fermenting or store heap; still, it involves less labour, and if properly conducted the results will generally be found to compare favourably with those attending the malting process.

A closed outhouse or barn with some top ventilation is the best place for making up the store heap; and a layer of clay 4 or 5 inches thick, beaten hard and smooth, makes a better foundation than either a wooden or brick floor in every respect. The size of the foundation will, of course, depend upon the quantity of food to be treated, but a 6 feet square (of clay, or clay mixed with a little sand) is a useful space for general purposes. If a cement or asphalt floor be available, then so much the better; but of whatever material the floor is composed it should be sprinkled with sand, coarse for preference, before proceeding to deposit the food in position. The foundation being ready, it now only remains to build up the heap of cooked roots, which should be piled up in layers, *crushing and pressing them into a firm and solid mass as the work proceeds.* Make the sides as solid and even as possible by cutting away the pulp forced outward by the pressure from above, returning it to the top and beating it firmly as before with the back of a spade. When finished, sprinkle the top and sides with a little coarse sand or flint grit to which has been added a dash of powdered charcoal, then place a few boards or a sheet or two of galvanized iron on the top, and the natural laws of chemistry will complete the process. If the temperature of the storehouse be equal to 60 degrees Fahr., or more, the stuff will be ready for use within 48 hours; but if below that temperature, then another two or three days should elapse before breaking into the heap. Roots thus treated will remain perfectly wholesome for a fortnight to three weeks, according to the size and solidity of the heap—the greater the mass, and the less superfluous moisture it contains, so is its value for feeding purposes increased and the longer will it keep. It is simply cut from the heap with a spade as required, and when making up the morning feed it may be mixed with a larger proportion of dry meal of some kind. A little water, hot or cold according to the state of the weather, may be added if necessary, but only when the root pulp does not contain sufficient moisture of its own to ensure a crumbly mixture, rather dry than otherwise.

N.B.—Salt must never enter into the composition of the fermenting heap; but whenever a little is deemed necessary it should be mixed with the dry meal before the pulp is added.

Malting.—The malt we use for increasing the digestible properties of poultry feeding stuffs is not, of course, the perfect article of commerce, although it makes an excellent substitute and satisfactorily serves the purpose for which it is intended. Our method of preparation is as follows :—

Put a bushel of barley (the raw grain) into a tub or other vessel, fill up with cold water to about 3 or 4 inches above the level of the grain, and cover with a perforated wooden lid (or a piece of small mesh wire netting) as a protection against rats.

If, in a day or two, the barley should have absorbed all the water, and the grain still remain firm to the touch, more water must be added and the grain left to soak until it is swollen and fairly soft—not bursting—when it is ready for the second process.

Strain off all surplus water through a sieve, make a heap of the grain on a clean wooden floor, cover lightly with a little clean straw, and allow to lie until it has germinated and the rootlets have begun to grow ; the sprouted grain is then ready for drying and storing for use as may be required. Strictly speaking, it should be kiln-dried ; but for the particular purpose in view it is possible to obtain a very useful article simply by drying the grain in an ordinary steam-jacketed boiler from which all steam or moisture is excluded, except, of course, that which is evaporated during the process. A temperature of 165 degrees Fahr., if maintained for three to three and a half hours, will generally suffice to kill all further vitality of the grain.

For ascertaining the internal heat of the mass, a long thermometer should be plunged into the centre, and, to avoid breakage, the bulb of the instrument ought to be fitted with a perforated metal protector. The cover of the apparatus should be kept slightly raised, so that all superfluous moisture may escape ; it is also essential that the grain should be stirred and moved about at frequent intervals, that at the centre being stirred towards the sides of the boiler where the heat is naturally greater, and consequently drier. When it is perfectly dry, and the grains readily crumble apart when handled, it should be removed and spread on the dry floor of a room or outhouse having a direct current of air passing through it, where it had better remain for a day or two preparatory to being stored away in galvanized bins or other damp-proof receptacles.

How to Use the Malted Barley.—The barley thus treated we keep on hand for use as required. It improves the feeding properties of such bulky articles of food as cooked roots in combination with bran, pollard, barley-meal, ground maize, peas, beans, &c., &c. ; and, it imparts to the mash an appetizing relish which is fully appreciated by the fowls. It may also be used to advantage in combination with cooked rice, the 'first' sweepings of biscuit factories, ground acorns, beech-mast, &c., &c. ; always, of course, including a sufficient quantity of dry meal to obtain a nice crumbly mixture. To whatever kind of feeding stuffs the barley-malt may be added it is important to observe the manner of their preparation, viz.—(1) The malt and meal should be mixed together and damped with hot water (not made into a sloppy mess) *the night before the feed is required for use,* and the cooked roots are to be added the following morning ; (2) the water used for damping should simply be hot—not boiling—say, 175 degrees Fahr. Boiling water that has been poured into an open vessel and allowed to cool for five or six minutes will, approximately speaking, be found to approach the desired temperature. Cover with a piece of canvas sacking, and in the morning mix in the roots, with more dry meal if necessary ; and (3) the proportion of malted barley (or the fresh sprouted article) should be about one-sixth part of the whole feed.

If the roots have been previously malted while in the fermenting heap (a method which we occasionally adopt) then it only remains to add the dry meal and to damp—if more moisture is necessary—and mix the mash at one operation just before feeding-time.

And the sequel of it all ?—*is more eggs.* Eggs, when the fowls of less thoughtful owners are left to make the most of a monotonous dietary of corn and meal, meal and corn (with, perhaps, a dose of somebody's quackery of the usual catch-penny order), spring, summer, autumn, and winter alike. But, *the trouble of it all—what about the labour and the trouble ?* Oh, well—*laziness never yet provided a very tempting board to sit down to.*

Liquor Extracts from Clover Hay, Grasses, Herbs, &c.

The uses of clover hay and other field and garden products when dried and converted into liquid extracts have already been touched upon. To prepare these extracts proceed as follows :—

Take from the store a mixed variety of the dry materials sufficient to last for two or three days only ; put them in a boiler or saucepan, cover with water, bring to boiling point, and allow to *simmer* for 20 to 30 minutes ; strain off the liquor into a bucket, and dilute with three parts water to one of the liquor before mixing with the morning mash. A convenient way of preparing small quantities is to put the materials into a galvanized bucket and stand it on a small oil-stove.

N.B.—Never add these extracts to pulped roots or vegetables, whether malted or not ; they should only be used with ground cereals, such as barley-meal, bran, pollard, bean-meal, &c., &c.

The residue—fibrous substances—(if in quantity) may be dried by exposure to the sun and wind, and then chaffed for use on the floors of the chicken-brooders, scratching-sheds, &c.

Fruit Marc Mealies.

For quantities under ½ cwt. it would scarcely be worth while to prepare fruit marc (or pomace) for storage ; but where the amount at disposal is fairly large, then the cost of preparation is relatively small when compared with the excellent product which it is possible to obtain by adopting the following simple process of manufacture.

To each bucketful of the solid marc, add :

Maize Meal	3 lb.
Bran	2 ,,
Common feeding Treacle	1 ,,
Hot Water	½ gallon.

Process.—Chop and separate the marc, add the meal and bran, and mix well together ; dissolve the treacle in the hot water, then mix and knead the whole together until it assumes the consistency of ordinary dough, but slightly stiffer and more solid if anything, adding more meal or liquid as the case demands. Knead and divide into pieces about the size of a large field turnip, roll them in dry barley-meal, and they are ready for cooking.

A steam-jacketed boiler of the larger type will hold a good many pieces of the size named. As they are to be *baked* (not boiled) in the dry air of the cooker, water must not be added to the inner or cooking vessel; the water in the 'jacket,' however, must be replaced at frequent intervals, as it exhausts itself rapidly when a brisk fire is kept up for several hours together. Those boilers heated with oil fuel are of little use for the work, and the quantity of oil consumed is extravagantly great.

When the apparatus has developed a good heat, the mealies—as we choose to call them for want of a better name—should be put in and carefully disposed tier upon tier without touching each other if possible; each tier or layer to be separated by a piece of coarse cheese-cloth, or thin, open canvas sacking, to ensure a free circulation of hot air throughout the cooking vessel. This arrangement also facilitates the removal of the stuff when cooked.

Keep the cover of the cooker closed, and if a brisk heat be maintained for 60 or 80 minutes (according to quantity of stuff treated) the mealies should then be fairly firm to the touch. Now remove them from the boiler, chop each one into four quarters with a hatchet, and return them to cook until dry-baked like the crust of a loaf of bread. When the apparatus is not required again for the day, the fire may be extinguished and the mealies allowed to remain until the following morning, when they should be taken out and crushed to pieces about the size of split peas, or, what is still better, put through a grist mill.

After exposure for two or three hours to the dry air of a warm room, the stuff is ready for storing away in covered bins. Of course, no hard-and-fast rule can be laid down respecting the length of time required for cooking, and in this the operator must exercise some little judgment of his, or her, own.

To Use the Mealies.—Scald with boiling water 20 minutes or so before the stuff is required, and mix with the morning mash in the proportion of two parts dry meal to one of mealies, with water just sufficient to make a free crumbly mixture; barley-meal, or equal parts bran and pollard (or sharps) are all good combinations. These mealies are not intended for everyday use, but as a supplementary article of diet to be given to fowls (adult birds only) occasionally, say, once or twice weekly. In cider-making districts hundreds of tons of apple pomace are utilized every year for manuring the land, much of which could, no doubt, be obtained almost for the mere asking. The fresh pomace when straight from the press generally contains a large proportion of juice, and when converted into mealies the juice is absorbed by the meal and bran.

In comparing the prime cost of this manufactured article with the prices of certain proprietary feeding stuffs, it should not be forgotten that it is, in reality, a concentrated food of greater feeding value than many expensive articles of the kind mentioned, to say nothing of the advantage of knowing the real composition of a food, an important factor in relation to the economy of stock-feeding generally.

Green Bone Mealies.

Fresh 'green' bone (the soft, spongy bones which any butcher can supply) also may be converted into mealies, and the resultant product stands high in our estimation as a food for all kinds of poultry, especially for fowls kept in confinement. The ingredients are easily procured, the method of manufacture is simplicity itself, and few, if any, proprietary articles equal it as a food for egg-production.

Composition:

Fresh Green Bones (finely cut) ...	1 Bucketful.
Maize Meal (or Buckwheat) ...	1 ,,
Bran	1 ,,
Salt	1 lb.

1st Process.—Put the ingredients (salt excepted) in a shallow tub or other vessel sufficiently large for manipulating the quantity of materials named, and mix until they are thoroughly incorporated; next dissolve the salt in ½ gallon of hot water, add cold water to make up 1 gallon, stir it gradually into the meal, &c., and mix the whole together until it assumes the consistency of stiff dough, adding more plain water if necessary; then divide into pieces the size of a large pudding basin, knead slightly, roll in dry meal, and cook exactly in the same way as directed for the fruit marc mealies.

2nd Process.—Same as for the fruit marc, except that the stuff when cooked and cooled should, before storing away, be dusted or mixed with a little barley-meal that has been dry-baked in a slow oven for 30 to 40 minutes, according to quantity and temperature of the oven; this admixture with a little meal makes the stuff less objectionable to handle, and, to a certain extent, renders it less attractive to flies. Prepare and serve to the fowls in the same way as advised for the fruit-marc article. If stored in a cool, dry outhouse the stuff will keep good for many weeks, according to the care exercised in its manufacture.

A Poultry Condiment for Occasional Use.

We are strongly adverse to the dosing of poultry with foods of a stimulating nature; the effect of such preparations is but temporary, and their cost is out of all proportion to the supposed good they do. They do not increase the assimilation of food, and, if often resorted to, their use becomes almost a necessity, until the birds lose their natural relish for the ordinary diet of wholesome staple feeding stuffs.

Following are the constituents of a harmless poultry condiment which may be occasionally added to the morning mash, but only when the air is laden with cold, raw moisture, or when biting, cold winds prevail:—

Bean Meal	3 lb.
Linseed (ground)	2 ,,
Mustard Seed (ground)	6 ozs.
Nasturtium Seed ,, ...	3 ,,
Ginger ,, ...	3 ,,
Anise Seed ,, ...	4 ,,

Mix well together and store in tins.

To Use.—To each large bucketful of dry meal add one breakfast cupful of the condiment; *mix thoroughly, moisten with hot water,* *and allow to stand for eight or ten minutes before it is served to the fowls. For half-grown pullets reduce the quantity by one-third, and never give it to birds under ten weeks old.*

It won't induce the birds to lay more eggs than usual; but it will help to fortify them against the effect of cold, damp weather, and to stimulate them to activity among the scratching material instead of standing shivering and crouching about in idleness. However, fowls are much better without stimulating foods, and only under the conditions named would we sanction their use.

Cooked Maize Corn.

THE effect of cooking maize corn would seem to be to accelerate the conversion of the albuminoids which it contains into matter of greater feeding value for laying stock, especially young pullets; much of this matter would, but for the chemical changes thus wrought, probably pass through the animal organism ere it had time to yield up the full amout of its latent nutritious properties.

But we do not for one moment advocate a total substitution of the cooked for the raw grain, for the very good reason that *the best results are obtained by using the two alternately.* Although the cooked grain apparently assists the functions of the digestive apparatus, and up to a certain point, acts beneficially, yet experience teaches us that such assistance—if continued for long—will ultimately exercise a detrimental effect upon the health of fowls if they are wholly deprived of raw grain.

Process of Cooking.—The maize should be cracked before it is cooked. Small lots may be treated in an ordinary oven, but for large quantities a steam-jacketed cooker is necessary.

A hot-air temperature of about 190 degrees Fahr. is the best, and if this heat be maintained for 60 to 100 minutes—according to quantity and type of apparatus used—then the grain may be considered as sufficiently cooked for the purpose in view.

The improvement effected by subjecting maize corn to artificial heat is, perhaps, still more pronounced when it is cooked in sand, and the extra labour involved is fully justified by the results which follow. The grain and sand are simply mixed together in about equal proportions, but the temperature in this case should reach 200 degrees, and 10 to 15 minutes more must be allowed for the process. Cool gradually, separate the grain from the sand by putting it through a wire sieve, and store in damp-proof bins.

The Merits of certain kinds of Garden and Field Produce as Food for Utility Poultry.

Kidney Beans.—Poultry keepers having spare garden ground should utilize some portion of it for raising an annual crop of kidney beans—both the French dwarf and scarlet runners—for the sake of the seed.

They are rich in nitrogen, are more easily assimilated by fowls than some other leguminous products, and no other vegetable so nearly resembles the chemical composition of animal flesh as kidney beans. The dwarf or French varieties are the best, but of course they do not yield such enormous crops as the runner or climbing varieties. Both, however, make excellent food for laying hens when judiciously combined with other feeding stuffs.

The crop should stand until the seed is perfectly ripe, when the produce may be threshed or beaten out on the floor of a barn or other dry outbuilding, then ground into meal or stored whole until wanted. The meal of kidney beans greatly increases the feeding value of bran, pollard, &c., when mixed and used together; add two parts of either of the last-named meals to one of the former.

Onions.—As a tonic and blood purifier combined, the onion is the most valuable of all vegetables for poultry.

The juices of the onion cleanse the blood, and help to ward off that dread scourge of the poultry-yard—liver disease; they keep the ovary in a healthy state, and increase the procreative powers of the birds; and they assist, in no small degree, in preventing egg-binding by strengthening and keeping the oviduct in a healthy, normal condition. The combs and wattles of fowls that are plentifully supplied with onions are generally full of rich, red blood, and when this is so the mucous membranes will also be found to be in a healthy state. But the veriest novice in poultry culture must know that the health of a fowl is reflected in the colour and plump appearance of its head appendages.

All poultry keepers, then, who would listen to the more frequent cacklings of their charges should not, where circumstances permit, neglect to sow a good breadth of onion seed every year; it is certainly a more interesting *and* more profitable occupation than listening to the cacklings of the poultry-medicine fraternity.

Really, the compounding of a farthing's worth of quackery to retail at a shilling or two would seem to be a more profitable game than the raising of bundles of prize-bred feathered monstrosities. The one represents a 'certainty,' in sporting parlance; and the other?—*all blanks and no prizes; feather dusters, but precious few eggs.* But this little digression of ours is merely by the way. Besides, to sally forth into the by-lanes of fancy featherdom not only provides food for the reflection of the human mind, but also reveals to us the host of mysterious things which have been devised for the physical regeneration of Britain's prize-bred animated egg machines.

We repeat, then, provide your poultry (of all ages) with a generous feed of onions every now and again, the juices of which are Nature's own ovary tonic and liver preserver combined. The young green plants—'scallions,' as they are called in some localities—taken from the beds when thinning operations are going on in spring and early summer should be chopped fine and added to the morning mash, with just a sprinkling of oats or buckwheat, and a dash of salt; the ripe bulbs also may be boiled, cut up, and used—liquor and all—in the same way.

Sunflower Seed.—Many people write and ask our opinion of the value of sunflower seeds for poultry-feeding purposes. As a food for everyday use they are of a far too fattening nature for either the laying or breeding stock, and if used to any appreciable extent they have a tendency to make the birds drowsy and listless. But if supplied by way of a change, say, at intervals of a week or more, and mixed with a mash composed of equal parts of barley-meal and bran, then the seeds of the sunflower may be recommended as a useful addition to the dietary of poultry. Not because of any peculiar chemical composition of their own, but solely on the score of *change and variety of rations* do we attribute the good effects to be traced to their use.

Green Maize.—In its fresh, green state, when the cobs or ears are full of milky juices, maize (Indian corn) has much to recommend it as a seasonable addition to the common dietary of fowls. Of course, the ears do not usually ripen in this country, but from the middle of August to October, a supply of nutritious green food may be obtained by field or garden cultivation. They may be either steamed and served to the fowls in their mash, or the green heads may be placed in a net made of tanned fruit (or wire) netting, and if suspended from a stake stuck into the ground the birds will enjoy pecking out the pulpy cobs.

Vegetable Marrows.—Marrows which have been allowed to grow beyond a culinary size provide excellent employment for poultry to peck at. They should be cut in halves, and stuck on the top of a short stake, not thrown down among dirty litter for the birds to pick up and pass with the food into their stomachs.

Fowls generally prefer the marrows cooked, and we frequently boil them together with clover, dandelion leaves, nettles, vine prunings, &c., with just a pinch of anise seed to add piquancy to the liquor ; it is then strained off, diluted with more water, and mixed (marrows included) with barley or other meal for the morning feed.

Rape Leaves.—Those farmers who do not despise poultry as a source of profit may like to know that the leaves of the rape plant, when used straight from the field, contain certain feeding properties which may be utilized to great advantage in the poultry yard.

The fresh leaves should be chopped very fine and given to the birds mixed with scalded meal of some kind ; or they may be used entire, in the same way as recommended for the raw green maize. Fowls, however, do not always take kindly to some varieties of green produce in a raw state, and in such cases it is better to scald and prepare it with meal, when they are almost certain to consume it.

Rhubarb for Poultry.—Rhubarb (stewed in a fair proportion of water) is invaluable as a corrective agent for fowls that have been fed on foods of too fattening a nature ; its juices are a sovereign remedy for that form of syncope to which so many highly-bred birds are subject ; and, in the summer, and during the moulting period, rhubarb liquor will assist in cooling the blood and purging the animal system of accumulated humours.

The stalks, which have been allowed to grow to their full size in summer, will keep in a fairly fresh condition for some time, if stored under cover in a heap of dry sand, burnt clay, cinder or wood ashes.

CULTURAL NOTES.

A FEW simple cultural directions concerning the more uncommon of the field and garden products to which we have drawn attention may, perhaps, prove helpful to those readers not familiar with their habits of growth, cultivation, and the methods of harvesting them.

Buckwheat.—Requires a light, rich soil to grow a full crop; clay, or heavy wet land is of no use for growing buckwheat. Owing to the danger of spring frosts, it is not advisable to sow the seed until the end of April or the first week in May; land which has been cleared of turnips or winter greens will do very well for this crop, thus allowing ample time for digging (or ploughing) and manuring preparatory to sowing the seed.

Sow broadcast at the rate of about a bushel per acre; rake (or harrow) lightly, so that the seed may be kept near the surface, then roll and protect from birds as much as possible.

Buckwheat flowers in July, and the crop is ripe for cutting in August or September, according to locality and weather conditions. Owing to the plants flowering and ripening their seeds somewhat irregularly, a portion of the crop is generally ripe and ready for cutting whilst the other is yet in flower, with the result that the yield of produce is not so great as would be the case were the whole of the crop to flower at the same time. From 30 to 32 bushels per acre may be considered a very fair crop.

When harvested, buckwheat is liable to generate a considerable amount of heat, for which reason it is very advisable to stack it in moderate bulk, say, in ricks not exceeding four or five loads each.

Two bushels of this grain when ground into meal contain greater feeding value than three bushels of barley-meal. When 'POULTRY EMANCIPATED' was first published we had not sufficiently tested the merits of buckwheat as a poultry food, but since then we have used it largely with the very best results. Indeed, we consider maize and buckwheat—in the order named—to be two of the most economical poultry-feeding stuffs it is possible to obtain.

Buckwheat is a crop which can also be strongly recommended to bee-keepers, as the flowers are particularly rich in honey-producing properties, and the plants are in full bloom at a time of the year when other flowers are getting scarce.

Canary Seed.—Thrives best in rich loam, which should be worked to a fine tilth before sowing. Sow the seed about the end of February or early in March in rows 12 to 14 inches apart. A quart of seed is sufficient to sow a plot of ground 250 square yards in extent. Commence to hoe among the plants when about 6 inches in height, and continue to keep down the weeds throughout the growing season.

The seed ripens from September to October. Threshing will be made more easy if the crop be left standing out for awhile (six to ten days) before harvesting, so that the night dews may loosen the husks or chaff. We only use canary seed as part of a mixture for feeding young chickens—not the adult birds.

Hemp Seed.—A light loam suits this plant; it requires a fine tilth of soil for the reception of the seed, which is best obtained by digging the land before Christmas and leaving it exposed in a rough state to the frosts of winter. If the soil is already fairly rich, very little manure will be necessary.

Sow the seed broadcast, from the middle of April to the beginning of May, and rake and roll the surface lightly immediately after sowing; 4 to 5 lb. of seed are sufficient for 200 square yards of land. Protect against the ravages of birds, and stretch a few lines of tarred or oiled twine across the growing crop by way of a little support in case of damage by gales of wind and heavy rains.

The male plants bloom and shed their blossoms a month or more before the female plants; the seed of the latter is ripe when the leaves fade and the seed-capsules change their colour to a brownish or greyish hue The plants are then pulled up, tied into bundles, and stood up in shocks until the seed is perfectly dry; *if shaken or handled roughly, much of the produce will be lost.*

A little hemp seed may safely enter into the composition of a chicken-feeding mixture, but the proportion should be very small We use it chiefly as an occasional 'appetizer' for the adult birds, but only during cold, wet weather, and at moulting time.

Maize.—Succeeds best on a rich, light loam, in a situation as fully exposed to the sun as possible.

The seed should be sown from about the 14th to the 20th April (*the time of sowing is important*), in rows 3 feet apart, either in drills, or dibbled in, about 2 inches deep (not deeper) and 5 inches apart in the rows, to allow for possible failures; thin the plants to 10 inches apart when 2 or 3 inches above ground. Earth up (slightly only) when 6 or 8 inches high, and hoe frequently to keep down weeds.

Cutting the cobs or ears may commence when they are fully formed and plump, which are used in their green state from the end of August to the early days of October. The green cobs are also much esteemed as a culinary vegetable in America.

Rye.—Does best on dry soils, and succeeds well after a crop of peas or turnips.

Dig the land before Christmas if possible, and leave it rough over the winter; a little manure may be applied a week or two before sowing, when the land should be forked over for the second time and raked to a fine tilth. The soil must not be too rich for this crop, otherwise there will be more straw than seed.

Sow the seed broadcast about the middle of March, at the rate of 2½ to 3 bushels per acre; then rake (or harrow) and roll somewhat firmly.

When the plants begin to change colour, the ears to bend, and the grain feels firm to the touch, the crop is ready to harvest; if left standing beyond the proper time much of the grain will be wasted during harvesting operations. Cut as close to the ground as possible, so that there may be no unnecessary waste of straw.

The sheaves are to be stood up in a slanting position (with the ears together) supporting each other, and tied with a single band. The stooks or shocks should remain standing until the straw is quite dry, when the crop is ready for removal to the rick-yard or the barn. Turning the sheaves early in the morning will hasten the drying of the straw, and also improve the appearance and quality of the grain.

Rye, when judiciously used in combination with other kinds of grain, contributes in no small measure to the economy of the poultry-food account.

Indeed, in the feeding and management of poultry kept for egg-production, experience teaches us this one great lesson, viz.:—*That in so far as the feeding of poultry for egg-production is concerned, the greatest success does not depend upon the merits or feeding properties of any one particular kind of feeding stuff, but is really due to a cunning combination of, and judicious use of, both raw and cooked foods in great variety.*

N.B.—In dealing with this part of our subject—cultural notes—we found it a somewhat difficult task to indicate any uniform method of procedure, or to state the exact quantity of seed required to sow a given area; because where one person may occupy sufficient land to justify the employment of horse and machine labour, yet another must, by force of circumstances, confine his (or her) operations to spade culture—the best of all culture in the end.

Hence the difficulty in presenting these notes in more definite language.

Maize as a Food for Poultry.

Referring to the Australian Egg-Laying Competition in 1904, the *County Gentleman* said: 'Another point worth noting in the report on the competition is that *the grain used consisted almost exclusively of crushed maize.* Maize or Indian corn is considered by most poultry-keepers here (meaning in England) to be extremely risky food. It is charged with being a prime cause of liver disease and the laying on of fat. Mr. Thompson (the manager of the competition) says 'that the experience gained at the competition *shows the fallacy of the theories of most authorities in England and Australia, who condemn maize feeding for laying hens.*' [The italics are ours.—H.S.]

Now, 'POULTRY EMANCIPATED' was first published in January, 1904, several months before the report of the Australian Laying Competition was received in this country. At page 48 we there said: '*Personally, we look upon maize as a most valuable food for egg-production if judiciously used in conjunction with other grain, besides being cheaper to buy and less wasteful in use than most corn.*'

The results of such an important competition as the one referred to have strikingly demonstrated the correctness of our teachings in more ways than one.

BUSINESS ANNOUNCEMENT.

At the request of a number of correspondents, and in order to meet the convenience of those people who either do not care to make their own Lampless Brooders, or who, before making up their own, would like to possess one as a pattern for their future guidance, we have made temporary arrangements with Mr. Edward Carson, of the Highview Press, Gomshall, Surrey, to have the Brooders manufactured under his immediate directions, and in strict accordance with the features embodied in our latest working model. Mr. Carson will also supply the 'Strathmore' Hot-Water Container separately, or any of the materials used in the construction of the Lampless Brooder.

Poultry breeders will be well advised to avoid the common practice of delaying their preparations for the breeding season until the last moment. The long days of summer and early autumn is the time to take advantage of for constructing home-made appliances, so that everything may be in readiness before Christmas.

CAUTION.

These pages have been written for the exclusive use of private people, and not for the benefit of pirate traders in poultry appliances. And, whilst any person is at full liberty to make the Lampless Brooder (or any other of our appliances) for his or her own private use, yet from past experience we find it necessary to utter a word of warning to all who may venture to infringe the copyright of any portion of the contents of 'New Developments in Poultry Raising,' or who may seek to exploit the title 'Lampless Brooders,' or in any way profess to supply appliances 'on the Strathmore system,' &c., &c.

H. S.

Published by
The Petite Culture
Press

Under Royal
Patronage

"Poultry Emancipated"

(With Illustrations.)

BY HELEN STRATHMORE

By Post
1/6

Post Free
1/6

"**POULTRY EMANCIPATED**" evolves a system of Commercial Poultry Culture never before practised in this country, and it is undoubtedly the most original and successful work devoted to this industry ever published.

Indeed, the Authoress has successfully grappled with a problem in a manner never before contemplated by any one of the numerous self-styled poultry "experts," many of whom have essayed to propound a subject which they apparently knew little or nothing about.

The entirely new and original system of Egg-Farming here advocated (now known as the "Strathmore System") bids fair to revolutionise the unprofitable methods hitherto practised in Great Britain.

The book is **illustrated with Photographic Views of Houses, Ground-Plan, etc., etc.,** as adopted by the authoress, and it exhaustively explains in trenchant language how a combined system of **Egg-Farming and Petite Culture** can successfully be made to yield a substantial and ever-increasing income by all who have a little spare ground and small capital at their disposal.

Not only does "Poultry Emancipated" reveal to the reader the whole secret of success in commercial poultry culture, but the authoress fearlessly unfolds to the public gaze a mass of startling truths concerning the Poultry Fancy, its Touts and Satellites; revelations which did not fail to produce a great sensation among all classes of poultry-keepers.

Not the least interesting feature of this unique contribution to poultry literature is a most humorous chapter, entitled—"BRITISH POULTRY-FARMING AS CONDUCTED FROM A CITY OFFICE" *(By Mark Tapley II.).*

The name—Strathmore—is now a household word throughout poultrydom, and is synonymous with all that is original and practical concerning the principles and practice of poultry-raising for profit.

A Record Circulation.

The immense popularity of Miss Strathmore's writings will be better understood when it is realized that her various publications have had a combined circulation exceeding 50,000 copies within the last six years; and that her readers include all classes of society, from Royalty down to the intelligent and discerning cottager.

N.B.—The Publications named herein can only be ob-

The Petite Culture Press,
~~BLETCHINGLEY, Surrey.~~
43 Essex Road, Watford.

Remittances must be by Postal Order, as stamps

:: PUBLIC OPINION ::

The Farmer and Stock-Breeder and Chamber of Agriculture Journal says: "The authoress is rightly imbued with disgust of ways that are dark in the poultry fancy. She vigorously and trenchantly exposes them in the interests of the hen that can lay and the pullet that can kill to profit its owner."

The Irish Farming World says: "This work is a scathing denunciation of fancy as opposed to utility poultry, and we heartily agree with what the writer says. The work is deserving of the closest attention, and we recommend it to every one concerned."

The Rural World says: "A very clever work dealing with poultry-keeping."

Dell's Agricultural Review says: "Nearly all other poultry books are stale and amateurish when compared with the work before us. It is teeming with information not to be found elsewhere, and its circulation should be enormous."

The Illustrated Rural Industries Magazine says: "Poultry Emancipated is certainly the most able work on practical poultry-farming ever written. It describes in detail an original system of egg-farming and petite culture which no other writer was acquainted with, and few indeed could possibly fail to make their little venture anything short of a splendid success, if the svstem advocated be carried out to the letter. [illegible] writer of this book succeeds because [illegible] ctical; other writers failed, because their systems were raised on theoretical priuciples only. We should imagine that the demand for 'Poultry Emancipated' will exceed that of all other poultry books combined."

The Farmers' Gazette says: "The section devoted to industrial egg-farming shows that the writer knows what she is talking about, and contains a mass of original and valuable information not to be found elsewhore."

"The poultry houses invented by the authoress eclipse all others I have ever seen."—**Newmarket.**

"I'm more than pleased with the book. The illustrations of houses alone must be a welcome suprise to all poultry breeders."—**Angmerlng, Sussex.**

"Poultry Emancipated is really capital, and the facts as Miss Strathmore gives them deserve to be more widely known. All honour to her courage and truthful candour."—**(Miss**

"I like the book very much, it is so good." —**(Rev. W. L. M., Mundford.)**

"A careful study of the book soon revealed to me the real causes of my past failures; and now, 18 months after putting its teachings into practice, I have in great part retrieved the losses sustained through following the disastrous advice given me in the columns of the fancy poultry journals."—**Tonbridge, Kent.**

"The book is written with consummate skill and care."—**Grosvenor Square, S.W.**

"I must congratulate the writer on the originality and pleasing features which characterize the whole of her really clever book."—**Christchurch.**

"For the success of my little poultry farm I am wholly indebted to 'Poultry Emancipated.' It is worth its weight in gold."—**Norwich.**

"The system of housing as illustrated in the book has been an immense success with us."—**Lancaster.**

"The whole of our poultry yards are in course of transformation on the lines described in 'Poultry Emancipated,' your system having already given the greatest satisfaction."—**Stockport.**

"We are delighted with the book, and desire another copy at your earliest convenience." —**Crowborough.**

"The whole book was a most agreeable surprise to us and is so very much different to the twaddle and self-interested stuff one is accustomed to read in the poultry press."—**Thirsk, Yorks.**

"We are feeding and managing our fowls according to Miss Strathmore's directions, with the pleasing result—that we are already getting many more eggs."—**From the Rev. J. Flynn, Ratcliffe College, Leicester.**

"Hitherto we have had tremendous losses in poultry-keeping, never being able to get anything like an adequate supply of eggs. But now, by following your excellent advice, we have had a particularly successful season."—**From (Mrs.) L. Scholfield, Esk-**

"A Triumph in Poultry Literature"—*Editor, "Rural Industries."*

"NEW DEVELOPMENTS IN POULTRY RAISING."

BY HELEN STRATHMORE

:: *With Complete Illustrations* ::

Demonstrating an entirely New Artificial Method of Brooding and Rearing Chickens, Ducklings, etc., etc., without the Aid of any Lamp-Heat whatever

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The system is as simple, efficient, and inexpensive in practice as it is original and ingeniously clever in conception. Will undoubtedly supersede the present costly and highly unsatisfactory system of brooding chickens in unwieldy Appliances, heated by dangerous, dirty Lamps, and similar contrivances.

The fact that this new and simple little Apparatus can be constructed at home by any person of ordinary intelligence, will give some idea of the immense value such a system must be to all engaged in the rearing of Chickens, either on a large or small scale.

The other half of this exceptionally clever contribution to poultry literature is devoted to

The Economic Production & Preparation of Home-raised Poultry Feeding-Stuffs.

Showing how to grow, manipulate, and improve the feeding value of a large range of Foods, rarely or ever thought of by poultry-keepers, on the same original and exclusive lines as practised for many years by the gifted Authoress herself, and for the first time now made available for public use.

Including the original Formulæ, and full directions for use, whereby poultry-keepers are enabled to reduce the cost of feeding stock by quite twenty per cent., and to obtain eggs in abundance, with greater regularity, especially at those periods of the year when they are scarcest and dearest.

Will prove a veritable blessing to every one engaged in poultry culture through- [illegible] object-lessons revealed in this little Work undoubtedly [illegible] in the history of Utility Poultry-Keeping, since they [illegible] important facts, viz.: *That Chickens, etc., can be raised* [illegible] *any of the present methods in common use; and* (2) *That* [illegible] *measures, the poultry food account can be reduced to the extent of twenty per cent. or more.*

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*"**New Developments in Poultry-Raising**" mailed Free per Return Post on receipt of Postal Order for 1/6; or with the companion publication, "**Poultry Emancipated**" price **2/6** inclusive and Post Free.*

Verdict of the Press.

The Field says: "Unlike the multitude of handbooks on poultry, the authoress of **New Developments in Poultry-Raising** departs from the usual custom of imparting mere elementary instruction. A detailed description, with illustrations, is given of the new Lampless Brooder, a simple contrivance of her own design, and such an appliance must certainly make for economy and the reduction of expenses, upon which success so largely depends.

vegetable material may be grown and economically employed in the feeding of the stock by means of certain processes of preparation which the authoress fully describes."

The Agricultural Gazette says: "The treatise contains many admirable arguments in favour of the new Lampless Brooder, which should be of immense advantage to those chicken raisers whose mortality bill exceeds the bounds

Verdict of the Press.—*continued.*

Poultry says: "The work will prove a most welcome addition to one's library, since it contains much valuable information for the poultry-keeper, whether he be utilitarian or fancier, in a large or small way. We are particularly struck with the excellent manner in which the food question is treated; and we feel sure that readers will find in the book much that will interest them and prove of profit in their poultry work."

The Irish Homestead says: "**New Developments in Poultry-Raising** is the title of a most interesting booklet, by the authoress of **Poultry Emancipated**, a work that has been widely read by poultry breeders. The authoress is the inventor of the Lampless Brooder, and her notes upon its construction and management are most instructive, and should be studied with care, since the brooder is essentially different in every respect from those better known to poultry breeders. The inexpensiveness of this new appliance will commend itself to many who rightly complain of the undoubted expense of providing a full set of costly brooders to rear the chicks as fast as they come from the incubators."

Farm and Garden says: "It is refreshing to read something new about poultry keeping, and this we certainly find in **New Developments in Poultry-Raising.** The work is original, and the result of long and close practical investigation on the part of the authoress. The Lampless Brooder which she has devised works with a much lower mortality amongst the chickens than other types; the entire absence of fumes and freedom from the danger and inconvenience of lamps being the chief advantage."

The Irish Farming World says: "The treatise is particularly interesting, and is by the well-known writer of **Poultry Emancipated,** a poultry breeder of undoubted extended and practical experience."

The Welshman says: "Every Poultry Breeder should certainly get a copy of **New Developments in Poultry-Raising.** It contains some excellent illustrations, and that part of the treatise devoted to the new method of rearing chickens by the aid of the Lampless Brooder is specially interesting and up-to-date."

The Lincoln Gazette says: "The treatise enables the poultry breeder to dispense with the lamp-heated brooder, and those who are intent upon success should study the question at first hand. Unlike most other poultry literature, Miss Strathmore's pages are full of common-sense views."

The Spalding Free Press says: "**New Developments in Poultry-Raising** is by an authoress who, in a previous work, has demonstrated her thorough practical knowledge of poultry-raising. The latest little treatise contains information of an original and exclusive nature, is thoroughly practical and to the point, and will well repay a study."

The Board of Agriculture and Fisheries have notified in their Journal the addition to the Board's Library of a copy of **New Developments in Poultry-Raising.**

The Standard says: "This practical, combative little work—New **Developments in Poultry-Raising**—is of considerable interest, and not a few of its recommendations are of real value. The writer comes forward with the assertion that an axiom of artificial rearing, acted on at least as axiomatic for a decade past, is not only a mere assumption, however plausible, but is, in fact, erroneous. The criticism of the author is intended avowedly to be destructive of the old hypothesis, and will need some answering. The purpose of the work is not, however, exhausted by one side of the critical gift; it proceeds into detail of a system and an appliance which should supersede the brooders which depend on lamps, etc. The new lampless brooder is strongly recommended, and full-page illustrations enable the most uninstructed henwife to see the method of the new teaching. The cost of the lampless brooder system, as contrasted with that of the lamp-heated brooders, would effect a saving of £8 in every £23 expended. We would also point out that the author is not content with destructive criticism, but essays, with considerable care and full detail, the harder task of constructive logic."

The Scottish Field says: "All who are aware how the ease of incubator hatching of chickens is counterbalanced by the difficulty of rearing them, will appreciate the valuable information contained in **New Developments in Poultry-Raising.** The second part of the little book treats of the economic production and preparation of home-raised poultry-feeding stuffs, and may be equally commended to the attention of all interested in poultry rearing.'

The Scottish Farmer says: "This unpretentious treatise will be of real service to all poultry raisers. The expert in poultry matters will understand what the authoress is driving at, and after perusal of the book will, no doubt, be prepared to give the system here advocated a fair trial."

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